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THE AUTOMOBILE

35 M.P.H. Over Oiled New Jersey Road

THE VITAL PROBLEM OF THE ROADS

50 M.P.H. Over Unoiled New Jersey Road

CLEVELAND, Sept. 21—In solving the vital problem of the roads the day has gone by when it was necessary to argue as to their value to a community. All are now agreed on this phase of the subject; the difficulty is to obtain the money with which to build. Then comes the really greater question of what kind of a road to construct to meet modern traffic conditions. Ex-Governor N. J. Bachelder of New Hampshire, Master of the National Grange, this morning, in one of the opening addresses of the Second Annual Good Roads convention, made direct reference to the startling change that has come in the movement for improving the surface of our highways.

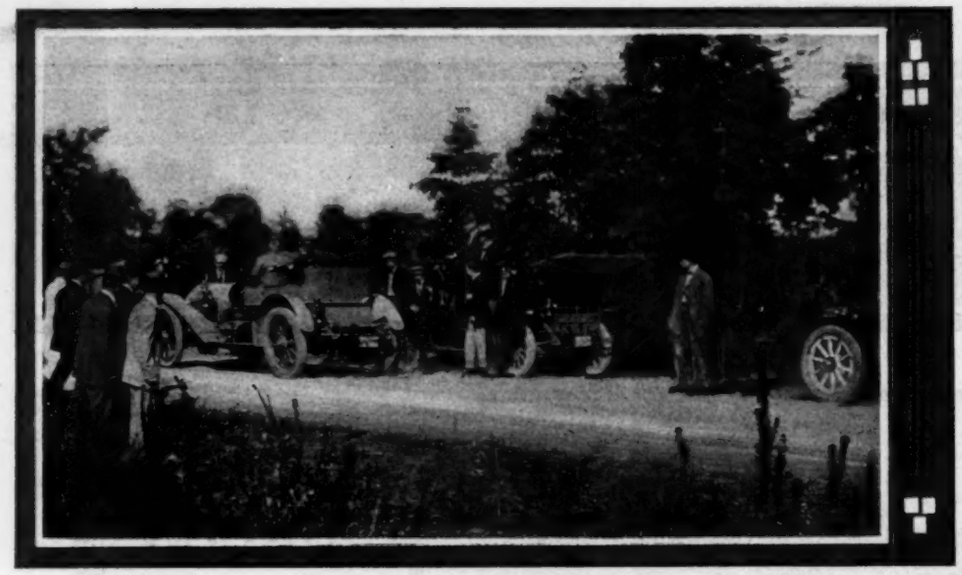
This gathering of good road workers amalgamates the National Grange, U. S. Office of Public Roads, American Road Makers' Association, and the American Automobile Association, with the latter body through its Good Roads Board carrying the burden of the promotion of the affair, this time under the chairmanship of George P. Diehl of Buffalo. The manufacturers of automobiles are also aiding appreciably through the N. A. A. M., A. L. A. M., and A. M. C. M. A. The 1909 committee from the various organizations consist of: N. J. Bachelder, L. W. Page, J. H. MacDonald, L. R. Speare, Geo. C. Diehl, Robert P. Hooper, Charles T. Terry, W. F. Bonnell, S. D. Waldon, Coker F. Clarkson, Alfred Reeves, and F. H. Elliott.

In the assemblage which is attending the sessions in the Chamber of Commerce hall are grangers and autoists and road makers of national importance from all over the country, the former being the most plenteous in number. The Cleveland Automobile Club is doing the entertaining honors in no scant manner. The proceedings embrace in the Second Regiment Armory a comprehensive exhibit of road-making machinery and materials and sample bits of construction.

Roads are being talked about from early until late, and the discussions which follow the readings of the various papers of the experts are instructing and entertaining. The deliberations impress even the layman with the stupendous importance of the subject, and when Lieut.-Gov. F. W. Treadway this morning gave utterance to the statement that in his belief it was the greatest issue of the day his words elicited prolonged approval.

Even now before the convention has concluded its labors there is talk of next year's event, with three cities in action for the honor. St. Louis has Samuel Capen, president of its automobile club, as an exponent, backed by the mayor and local business organizations; Rochester, N. Y., is being energetically heard from through Bert Van Tuyle, who is secretary of the New York State Automobile Association; and Milwaukee has an effective shouter in James T. Drought, secretary of the Wisconsin State Automobile Association. Other candidates are known to be in the background and will be heard from before the dispersal Thursday night.

In the vicinity of Cleveland an unusually large number of contracts for road construction have been completed or are in prccess of completion at the present time. Nearly every type of road is provided for, which makes it possible for the convention delegates to gain an excellent idea of what might best suit their respective localities. This Committee on Practical Demonstrations contains well-known engineers from various states, cooperating with whom are the Cleveland city and Cuyahoga



50 M. P. H. Over Unoiled New Jersey Road in Recent Experiments

county engineers. While this inspection is scheduled for Wednesday afternoon, not a few of those in attendance have covered more or less of the diversified route. Brick pavement is exceedingly popular in this state, and excellent samples of it are available for the inspection of the convention participants.

Tuesday Morning's Opening Session.

President L. R. Speare called the convention to order shortly after 10:30 o'clock. He read a message from Governor Harmon regretting the inability of the chief executive to give an official welcome from the State of Ohio. Likewise Mayor Tom L. L. Johnson was an absentee, ill health preventing his attendance. In the course of Mr. Speare's brief remarks, full credit was given to the press for the abundance of publicity given to the convention and good roads matters generally, with a further reference to the progressiveness of the Automobile Club of Springfield, Mass., which was the real originator of good roads gatherings wherein all classes of road users were invited to participate. The first National convention was that at Buffalo a year ago under the direction of Robert P. Hooper, then the Good Roads chairman of the A. A. A., the success of which was sufficient to insure a continuation of these meetings under the direction of the automobilists.

It was then that City Solicitor Newton D. Baker appeared on the scene and supplied a rhetorical welcome to the City of Cleveland.

G. A. Will of the Minnesota delegation arose and spoke of the most excellent good roads work of Governor Johnson, whose death was announced in the morning papers. Suitable resolutions were offered and unanimously adopted.

Chairman Diehl then took charge of the convention. Before introducing the following speaker the chairman referred to the enormous amount of work accomplished by the National Grange, whose aid was most essential in furthering highways' improvement.

State Highway Commissioner James C. Wonders of Ohio gave the history of the roads movement in Ohio, the first real work having been begun in 1907 by the State Highway Commission. Twenty counties and an expenditure of $240,000 represented the beginning, mostly in the eastern counties of the state. Gravel roads were the most numerous and satisfactory because of their reasonable cost, though brick paving at a heavier first cost proved the best surviving roadway. Moreover, the latter allowed more speed, which is not wholly distasteful to farmers.

Lieut.-Gov. Treadway was next introduced, explained why he was a delinquent, and graciously told his hearers that they were welcome in the Commonwealth of Ohio. He referred to the roads question as the greatest issue of the day, and said when it was settled many other minor matters would be attended to at the same time.

Master of the Grange Bachelder said that a million grangers had preached the story of roads in and out of season and were entitled to a goodly amount of credit for the now unanimous chorus for good roads, which had become a National movement. The speaker asserted that other work was necessary besides the holding of conventions and meetings, which, nevertheless, gave excellent opportunity for a valuable interchange of ideas. No arguments were now necesary for roads, and the farmer believes that the National government is in duty bound to give aid. This was made evident by the report of the Country Life commission which corresponds with more than 500,000 farmers.

During the session a telegram was read from ex-President William H. Hotchkiss of A. A. A., which contained congratulations upon the assured success of the convention and expressed regrets that he was unable to be present.

New Jersey Road with Clay Road Bed Surface—Fairly Satisfactory

What Happened in the Afternoon

First of the talkers of the afternoon was State Highway Commissioner MacDonald of Connecticut, who can talk roads on a 24-hour stretch without a pause and all the time supply material that is meaty and interesting. Connecticut is one of the most energetic States in the matter of roads, and follows very closely in the wake of Massachusetts and New Jersey. Commissioner MacDonald naturally takes pride in the work that has been accomplished.

George S. Ladd, the special good roads lecturer of the National

Grange, had an entertaining subject in "The New England Plan for Connecting Lines of Trunk Highways." Mr. Ladd's success in his special field has been exceptionally notable.

"The Farmer's Interest in Road Improvement" was the subject handled in a masterly fashion by the Hon. T. C. Laylin, Master of the Ohio State Grange.

The Hon. F. N. Godfrey, Master of the New York State Grange, had for his subject "The New York State Grange and Good Roads Legislation in That State." Mr. Godfrey knows the science of road making, and how to get roads built, and the $50,000,000 appropriation in New York State has its existence in the effectiveness of the campaign waged by the State Grange.

George T. Barnsley, of the Automobile Club of Pittsburgh, read the paper of E. J. Kent on "Good Roads in the State of Pennsylvania," which are not as numerous as automobilists would like to see, the veto by Governor Stuart of the Philadelphia-Pittsburgh highway having been one of the disappointments of the last Pennsylvania legislative session.

A general discussion, limiting each speaker to two minutes each, concluded the program for the day.

Illustrating Roads Building in France—Showing Tree Protection

Brief Details of Second Day's Session

CLEVELAND, Sept. 22—The morning session of the Good Roads conference to-day was comparatively brief, but the three addresses given were among the most valuable of the convention.

Logan Waller Page, Director of the Office of Public Roads, had for his subject "The Road Situation in the United States as Compared with Foreign Countries," in the course of which he explained in a concise manner why many of our efforts have miscarried.

Chairman S. Percy Hooker, of the New York State Highway Commission, gave an excellent talk on "New York State Trunk Lines," and President H. H. Gross, of the Illinois Farmers' Good Roads League, spoke about "Illinois Good Roads," admitting that his State is just awakening. Then followed the road inspection trip to the various suburbs of Cleveland, with luncheon at Euclid Park Beach Hotel.

Much interest was aroused by the exhibition of road-making machinery and materials. This is free to the delegates, and nearly all of them took advantage of the opportunity to visit it.

EFFECT OF AUTOS ON ROADS TESTED IN NEW JERSEY

NEWARK, N. J., Sept. 18—Popularly current notions of the effect of automobile traffic on roads received a severe setback in the tests conducted by County Engineer Owen on Ridgewood avenue, Glen Ridge. The results obtained all go to show that automobiles, even at high speeds, do not have as destructive an influence on the road-bed as heavy horse-drawn wagons. Over a mile stretch of road eleven automobiles, weighing from 2,000 to 3,800 pounds, were driven at speeds of from ten to sixty miles an hour. At a low speed the automobile tires merely compressed and packed the road surface. The limit of speed at which no effect could be observed was about twenty or twenty-five miles an hour. At higher speeds a stripping action began, which if continued would cause loosening of the surface. However, the only dust raised was that already loose on the road.

After the automobile had finished speeding, five heavy coal wagons were drawn over the highway to ascertain the effect of this kind of traffic. According to the county engineer's notations the result showed that the hammering of the horses' calked shoes and the iron-tired wagon wheels tended to bring about a complete breaking up of the road. Large stones that were undisturbed by the autos were displaced by the horses and wagons.

"The wear and shattering of the surface of macadam roads," said Mr. Owen, "is not due alone to the

Massachusetts Supplies State Highway Like This in Goodly Quantity

Road Across the Pocono Mountains in Pennsylvania

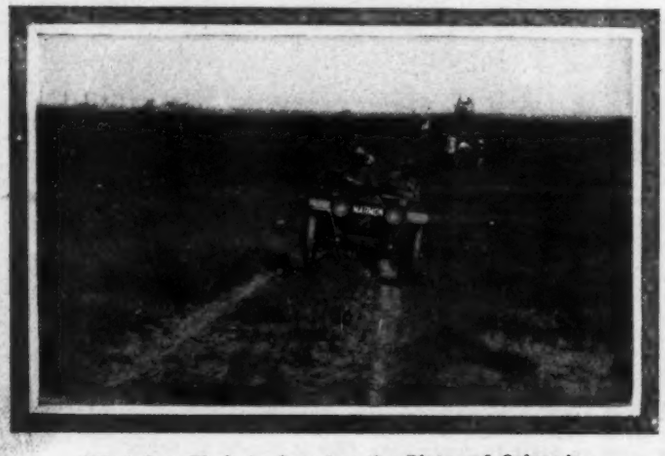
combination of this sort of traffic with horse-drawn vehicles. The roads of the future which are to take this travel and the methods of road maintenance of the future must be adapted to this end and with this point in view. The results of these tests were not in accordance with the general expectation or accepted opinions. Instead of the high speed breaking up the surface and scattering the loosened particles, no such results were noted. The dust that had accumulated was in all cases the only medium distributed." Mr. Owen's figures on the results of autos traveling at varying speeds were as follows:

For Telford Surface—Ten miles an hour, no trace left in center, compression of dust at side; twenty miles an hour, the surface dust spread sideways, but no stripping; thirty miles an hour, surface dust begins to strip; forty miles an hour, surface under tire swept bare; forty-five miles an hour, dust lifted, surface stripped, but no breaking; fifty-five miles an hour, road stripped bare, but no breaking; sixty miles an hour, road stripped bare, but no breaking.

Oiled Road—Thirty miles an hour, heavy oiled dust raised about one foot; forty miles an hour, heavy oiled dust raised about one foot; sixty miles an hour, strips dust. The high speed on the oiled road had no effect on the surface, either by loosening it or scattering the particles sideways.

Clay-packed Surface—Fifteen miles an hour, compression only; twenty miles an hour, dust raised; thirty-five miles an hour, heavy dust raised, no breaking; forty-four miles an hour, heavy dust raised, no breaking; fifty-two miles an hour, heavy dust raised, no breaking.

Where the tests were held the roadbed is about eight inches deep, of which the surface coating, originally three inches thick, was reduced to about two inches. The road has not been repaired for three or four years. No attempt had been made at dust-laying—in fact, the avenue was purposely neglected for the tests. The effect of the continuous automobile travel of recent years was to lay the center completely bare of the dust covering and loosen the smaller stone. Few large ones were displaced in a length of half a mile. The dust covering which accumulated on the sides was packed down fairly hard and smooth. In a stretch of half a mile only slight abrasion was apparent.



What One Finds in Crossing the Plains of Colorado

PROGRAM OF GOOD ROADS CONVENTION

TUESDAY, SEPTEMBER 21—MORNING SESSION

Opening Address—Lewis R. Speare, president of American Automobile Association.

Welcome to Ohio—Lieutenant-Governor Treadway.

Address of Welcome—Newton D. Baker, City Solicitor of Cleveland.

The Second Annual National Good Roads Convention and Introduction of Speakers—George C. Diehl, presiding officer and chairman of the national committee, directing the convention.

Good Roads of the State of Ohio—James C. Wonders, State Highway Commissioner of Ohio.

The National Grange and Good Roads—Ex-Gov. N. J. Bachelder, Master of the National Grange.

AFTERNOON SESSION

State Aid—James H. MacDonald, State Highway Commissioner of Connecticut.

The New England Plan for Connecting Lines of Trunk Highways—George S. Ladd, special Good Roads Lecturer of National Grange.

The Farmers' Interest in Road Improvement—Hon. T. C. Laylin, Master Ohio State Grange.

The New York State Grange and Good Roads Legislation in that State—Hon. F. N. Godfrey, Master New York State Grange.

Good Roads in the State of Pennsylvania—E. J. Kent, vice-president Automobile Club of Pittsburg.

WEDNESDAY, SEPTEMBER 22—MORNING SESSION

Convention Called to Order—By George C. Diehl, National Good Roads Chairman of A. A. A.

Road Situation in the United States as Compared with Foreign Countries—Logan Waller Page, Director of Office of Public Roads, Washington, D. C.

California Believes in the Petrolithic Proposition

New York State Trunk Lines—Hon. S. Percy Hooker, chairman New York State Highway Commission.

Illinois Good Roads—H. H. Gross, president Illinois Farmers' Good Roads League.

AFTERNOON SESSION

Practical demonstrations and road inspections.

Complimentary luncheon will be served at the Euclid Beach Park Hotel.

THURSDAY, SEPTEMBER 23—MORNING SESSION

Postal Progress League—James L. Cowles, secretary and treasurer.

Treatment of Earth Roads—D. Ward King, Missouri State Board of Agriculture.

Macadam Roads—A. B. Fletcher, secretary Massachusetts Highway Commission.

Bituminous Road Materials—Provost Hubbard, chemist United States Office of Public Roads.

Road Maps and Signs—Powell Evans, president Automobile Club of Philadelphia.

General discussion.

AFTERNOON SESSION

Boat ride on Lake Erie. Steamer "City of Detroit" will leave foot of Superior street. Complimentary luncheon will be served on board.

Theatrical performance, Chamber of Commerce Hall, at 8.30 P. M., by the famous Hermit Club of Cleveland. Music by Hermit Club orchestra.

Mud Roads That Abound Through the Middle West Are Best Traveled in Dry Weather

WHAT ONE MAN OBSERVED IN THE GOOD ROADS PROBLEM

BURLEY B. AYERS is the chairman of the good roads committee of the Chicago Automobile Club. Years ago he was one of the leading wheelmen in the country, and during L. A. W. days, he was prominent in its efforts to obtain good roads. Recently Mr. Ayers took automobile trips which included parts of Illinois, Michigan, Iowa, Indiana and Wisconsin, and in the journal of the Chicago Automobile Club he has some interesting comments to make. Extracts from his story are herewith given:

"The reason why such great states as Michigan and Illinois do not have good roads may be traced to the tenant-farmer system. In these States most farms are occupied by tenants, while the owners live in the little cities or villages. The farmers have to support two families. The owner expects the farm to yield all possible for the tenant and himself, and hence the least expenditure upon buildings, fences, roads and such improvements. The money is put into the farm machinery. This is evidenced by the general appearance of the farms. In the midst of great prosperity, with great crops growing everywhere, farmhouses and barns and roads and fences are dilapidated.

"In Wisconsin it is different. The Germans settled it and are there still, or their descendants. They still own and occupy the farms, and they have put their money into the houses and barns and fences and roads, and keep putting it in. No farming country in America shows such amazing results of prosperity as Wisconsin. Old barns and houses have been torn down and new and beautiful structures erected. No other farming country shows as many great barns with slate roofs, as many farmhouses with bay windows and big plate-glass fronts. No other State can display so many fine front lawns in front of the farmhouse, and generally makes such an exhibit of genuine country luxury as Wisconsin. All because the owners live on their farms, love them, and put in money for improvements.

"Talks with farmers all through these States absolutely show this to be the case, and also show evidence of a return to the old resident habit again. The trolley car and the telephone together form the cause. Many owner-farmers say they would not live on their farms under the conditions of ten years ago. Then they had to walk the plow, walk the harrow, walk the seeding, walk and hew and split and toil until the body was exhausted and life lost its joy compared with the life of the dullest crossroads village.

"But new farm machinery gives a new aspect to life on the farm. No longer has the farmer to hitch up and drive to the village for anything—the trolley takes him. The telephone summons aid and supplies that are sent out by the next trolley.

"Motoring through the great Michigan highway (deeply sanded) between Kalamazoo and Detroit reveals a strange absence of farmers' rigs. The farmers explain that where the road was once crowded with them, the way is now cleared for the automobiles to struggle with the sand, while they go to town by trolley. In Iowa and Wisconsin a great many use their motor cars. Iowa is much like Wisconsin in that the farmers own their farms, make them handsome, and contribute to their roads.

"And the deduction is this: There will be no good roads until the ratio of profit between the owner and tenant is so arranged that there will be a comfortable margin to draw on for the roads. While the fight is still on between owner and tenant for necessary improvements on the farm itself, the owning farmers will beat any bill in the legislature looking toward road improvements. And when one looks back on the history of these movements—notably the Michigan good-roads movement that recently came to defeat in the legislature—the cause is to be traced to just this source.

"Farmers are wonderfully interested in automobiles. Throughout the above-referred-to journeys, they readily yielded more than their share of the road. Iowa and Wisconsin lead in farmers' ownership of automobiles. They have many good points to offer about handling them, too, and the writer learned from Iowa that steel-studded treads were very efficacious."

PLANS FOR ROADMAKERS' CONVENTION

COLUMBUS, O., Sept. 20—The executive committee in charge of the annual convention of the National Roadmakers' Association, which will be held in this city October 26 to 29, has named the following chairmen of subcommittees: Invitations, Governor Harmon; reception and registration, Max Morehouse, president of the Columbus Automobile Club; entertainment, Herman Hoster; publicity, M. M. Maxwell, secretary of the Ohio Good Roads Federation; transportation, J. C. Wonders, state highway commissioner; programs, badges and printing, W. Hague; hotels and headquarters, H. C. Pirrung; speakers, George W. Lattimer; exhibits and demonstrations, Walter Braun.

FRANCE WILL HAVE A SINGLE-CYLINDER RELIABILITY

PARIS, Sept. 15—France has held many a pure speed contest for voiturettes, but has never dreamed of running a reliability and endurance contest for her little one-lungers. Following the example of the English club, which has made famous its reliability trials, next Winter there will be a reliability trial in France, the participants in which will be standard models of small two-seated voiturettes. The full regulations have not yet made their appearance, but it is understood that the vehicles provided for will be small single, twin, and four-cylinder cars not exceeding ten-horsepower and fitted with a two-seated body. It is the smallest type of car made in France and one of the most popular.

December 5 to 19 have been fixed as the dates, and the trials will be held in the neighborhood of Paris. For fifteen successive days the competing vehicles must daily travel 124 miles—or a total of about 1,860 miles—at an average speed of not less than 15 1-2 miles an hour. In the running time will be included the filling of gasoline and oil tanks, the oiling of the cars and any adjustments that may be necessary. As the start will have to be made from a garage in the suburbs of Paris, and a return made to the same point each evening, over roads that are always poor in Summer and decidedly bad in Winter, considerably more than 15 1-2 miles will have to be maintained at times in order to keep up the average.

The competing vehicles are two-seated voiturettes, of absolutely standard model, the maximum engine dimensions of which are 44-5 by 59-10 for a one-lunger; 39-10 by 51-10 for a twin-cylinder engine, and 3 1-10 by 4 7-10 for a four-cylinder motor. Stoppages allowed are for tire trouble, the cleaning of spark plugs, the tightening of nuts, the regulation of brakes or chains. Even the changing of a sparking plug will cause the loss of a clean score diploma.

No mechanic is allowed, but in addition to the driver each car must carry an official observer supplied by a rival firm, who will be charged to note all road incidents. The contest is the first of its kind held in France, and as small cars and voiturettes are now receiving a large amount of attention entries are expected to be high.

Although reliability trials have been inaugurated, voiturette racing has not come to an end. The organizers of the annual race for small one-lungers have just anounced that the sixth annual will take place next year as usual, the date being August 21. The regulations, which up to the present have been a limitation of bore, with unlimited stroke, have not yet been published.

PLEASANT COURSE FOR TRADESMEN'S TOUR

FOR varied and picturesque scenery and uniformly good roads, Long Island, the "Land of Pastime," can hardly be surpassed, and the second annual tour of the New York tradesmen, September 28, 29 and 30, will lead them through the heart of that pleasant country. Three days' touring, from one end of the island to the other, will make an agreeable break in the monotony of the season. From an early morning start at Columbus Circle, the caravan will leave Manhattan by way of the Queensboro bridge and take the Jericho Turnpike for Krug's Corner, long associated with memories of the Vanderbilt Cup races. Smithtown, 43 miles from New York City, will be the first checking station, and the participants should have no trouble in keeping to schedule time on this stage.

Thence the road leads straight to Riverhead. The route selected by the pathfinding party lies through a vast expanse of pine forest like that of the Lakewood region, where the air is sweet with the fragrance of the pines. At Riverhead the tourists will be regaled with a Long Island dinner. Here the route meets the course of the Long Island Derby and follows it to Mattituck. The night stop will be Orient Point, the extreme end of the North Shore. The fishermen of the party will go out in Plum Gut after bluefish, and dancing and games will close the day.

After an early morning start the cars will retrace their trail to Mattituck and will stop at the grandstand to witness the Long Island Derby, which is expected to provide some good racing. A tire and rim competition has also been arranged to demonstrate the practicability of the new types of demountable rims. After luncheon in the grandstand the tour will continue to Riverhead and will then cut across country to the South Shore by way of Flanders and Goodground. Passing through the picturesque Shinnecock Hills and skirting Shinnecock Bay the tourists will reach South Hampton and Amagansett, the extreme end of passable roads in the South Shore sand hills. The second night stop will be at The Irving, South Hampton.

The third day's run will lie along the South Shore, through Quogue, West Hampton, Brookhaven, Patchogue and Blue Point, famous for its oysters; thence through Islip and Bayshore to Long Beach, the noon control, where lunch will be served at the Hotel Nassau. When the tourists regain New York, by way of the Merrick Road and the South Hempstead Turnpike, they will have covered approximately 335 miles. The rules are liberal and should appeal to private owners, but the schedule will have a tendency to keep excitement and interest from waning. At the same time it will be distinctly an event for the whole family.

FLORIDA'S NEW LAW SEEMS REASONABLE

TALLAHASSEE, FLA., Sept. 11—The legislature at its last meeting passed the new automobile law, which is meeting with general approbation. No fixed speed limit is named, but speed must always be "proper and reasonable, having due regard to the traffic and use of the highway." However, at crossings, sharp turns, and approaches to bridges the limit is four miles an hour. Automobiles must be registered with the Secretary of State, the fee being $2. Chauffeurs must also be registered. Non-residents registered in other states are exempt for thirty days. Automobilists are required to use reasonable care in passing horses and to stop on signal of uplifted hand. Imprisonment penalties are provided for second and third offenses.

MITCHELL MILITARY CAR ENDS TRIP

SAN FRANCISCO, Sept. 19—The Mitchell military car, carrying a message from General Wood of New York to General Weston of this city, arrived here at 2 o'clock this afternoon, after exactly a month on the road. Driver Zirbies, Lieutenant Rosenthal and Private Parrott, the crew, reported in good condition, although days of battling with rain and mud in Wyoming, following the scorching heat of Nebraska, had left their imprint on both faces and uniforms. At Evanston, Wyo., the tourists ran into a heavy snowstorm. From Salt Lake City to the Coast no especial difficulties were encountered. Considering the inexperience of the driver and crew in this sort of work, the time made for the long trip from coast to coast was very good.

U.S. Has Vice-President At New York State Fair Races

SYRACUSE, N. Y., Sept. 18—The greatest crowd ever assembled within the track enclosure of the New York State Fair grounds saw Barney Oldfield drive some fast miles and several other pilots go well under the mile-a-minute mark. Vice-President Sherman headed the list of distinguished visitors, and was greeted as a native son by the Uticans present. Twelve hundred automobiles filled the parking spaces, and the trackside was crowded with spectators. The race meet was arranged and conducted by the Syracuse Automobile Dealers' Association, the Automobile Club of Syracuse and the Syracuse Motorcycle Club. Although no records were broken, the times were fairly fast for a mile circular track, and there were some good contests.

Shortly before the third event, the five-mile free-for-all, an accident was narrowly averted which might have proved serious. Hanna, while tuning up his Hudson runabout, came down the stretch at a fast clip, followed by Oldfield and the big Benz, going at a much higher speed. Hanna slowed down opposite the upper end of the grandstand and carelessly swung across the track squarely in front of Oldfield. The latter, with great presence of mind, turned his car out just in the nick of time. Otherwise the little Hudson would have stood a good chance of being reduced to scrap iron.

The feature of the day was Oldfield's attempt to lower Ralph De Palma's mile circular track record of 50 4-5 seconds. Twice he dashed around the track, the first time in 53 3-5 and the second in 53 2-5, but that was the best he could accomplish. Then Barney took the wheel of C. A. Benjamin's Knox stock car for the ten and twenty-five-mile races, and made some fast time. In the former he had several brushes with C. H. Bowers in the resurrected Peerless racer, which finally burst a front tire on the ninth lap. Oldfield won in 10:57 3-5, followed by two of the Maxwells that participated in the Lowell meet. The twenty-five-mile race was to have been fifty miles, but was stopped at the halfway mark with Oldfield a mile in the lead.

The motorcycle races, as usual in meets of this kind, put up the closest finishes and were on the whole the best. A. S. Noonan finished second in both the five and ten-mile events, but was disqualified for failing to appear to have the cylinder of his machine measured to find whether it complied with the rules for stock machines. The summaries:

FIVE MILES, GASOLINE STOCK CARS, $1,250 AND UNDER

Pos.	Car	Entrant	Driver	Time
1	Hudson	Amos-Pierce Auto Company	Hanna	5:49 1-2
2	Maxwell	Maxwell-Briscoe Company	See	
3	Maxwell	Maxwell-Briscoe Company	Costello	

FIVE-MILE, FREE-FOR-ALL—BEST TWO IN THREE HEATS

	First Heat:			
1	Benz	Barney Oldfield	Oldfield	5:15 1-2
2	Special	C. H. Bowers	Bowers	
	Second Heat:			
1	Benz	Barney Oldfield	Oldfield	5:06 3-4
2	Special	C. H. Bowers	Bowers	

FIVE MILES—GASOLINE—AMATEUR DRIVERS

1	Thomas	James Barclay	Barclay	5:55 1-5
2	Maxwell	Maxwell-Briscoe Company	See	
3	Maxwell	Maxwell-Briscoe Company	Costello	

TEN MILES, FOR GASOLINE STOCK CARS—OPEN

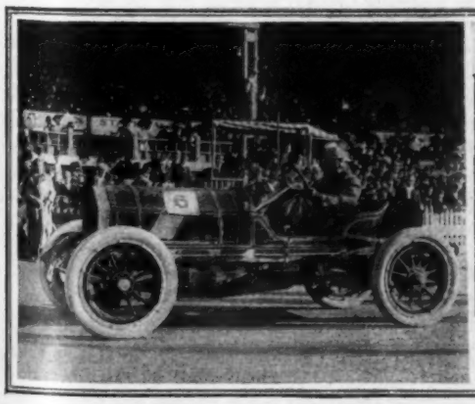
1	Knox	C. A. Benjamin, Inc.	Oldfield	10:57 3-5
2	Maxwell	Maxwell-Briscoe Company	See	
3	Maxwell	Maxwell-Briscoe Company	Costello	

TO LOWER MILE RECORD ON CIRCULAR TRACK

	Benz	Barney Oldfield	Oldfield	0:53 3-5
	Benz	Barney Oldfield	Oldfield	0:53 2-5

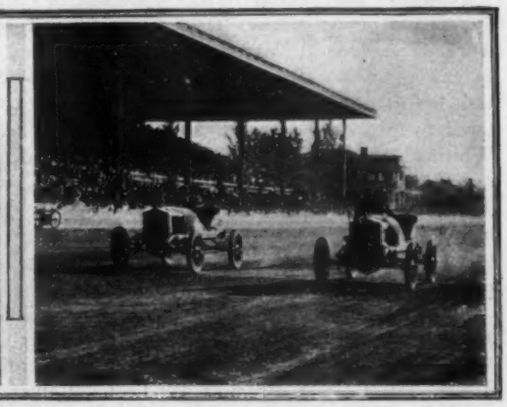
TWENTY-FIVE MILES, FOR GASOLINE STOCK CARS—OPEN

1	Knox	C. A. Benjamin, Inc.	Oldfield	25:40
2	Peerless	C. H. Bowers	Bowers	
3	Maxwell	Maxwell-Briscoe Company	See	



Barney Oldfield in Knox Winner

Hudson (Hanna) Winner 5-Mile



Maxwells Neck and Neck in 10-Mile

FIRST DAY OF MUNSEY TOUR SUCCESSFULLY COMPLETED

WASHINGTON, D. C., Sept. 21—Despite the early starting hour, all Washington seemed to be abroad this morning when the Munsey reliability contest was sent away from the Munsey building. So dense was the crowd, that it reminded one forcibly of the Glidden start—minus the cannon. It was the original intention to send the first car away at 7 a. m. sharp, but an accident to the elevator at the official garage not only put one of the contesting cars—Matheson, No. 27—temporarily *hors du combat*, with a smashed fuel tank, but marooned five of the cars on the second floor. Quick work by a corps of helpers got the quintet down to the street level in short order, and an extra fuel tank was secured to take the place of the one the Matheson lost when the lift dropped. Referee Trego allowed the crew of the disabled car to check out as soon as repairs were completed, at 9:33.

The Trophy That Is Contested For

Besides the contesting and official cars, there are two non-contestants—an Autocar truck with P. J. Thacher at the wheel, and a Detroit electric driven by George M. Bacon. The truck is carrying extra confetti and passengers' baggage.

There is one lady on the run—Mrs. Frank P. Hall, wife of the owner and entrant of the Columbia, No. 15. This plucky enthusiast vows she will cover the entire 1,282 miles.

For various reasons, but 25 of the original 37 entries put in an appearance at the start this morning. It was rumored that a few of the delinquents demurred at the stringent rules, but it is probable that this was not the true reason for their failure to have their cars in Washington in time to undergo the preliminary examination by the technical committee. Accidents kept out at least two prospective entrants. The Acme was one of these. One entrant gave as a reason for his delinquency that he was "too busy." Others had sold the cars they had intended to enter. Still others advanced failure to secure 1910 models as their reason. These recalcitrants destroyed the hopes of the Munseyites that their run would out-Glidden the Glidden in importance—at least so far as the number of contesting cars was concerned.

Yesterday and Sunday technical committee chairman Frank H. Trego and his assistants, "Doc" Overpeck and Jesse L. Cassard, worked overtime at Warner's garage, examining and sealing the 25 cars. By working rapidly they were enabled to finish their task before sundown. Six of the contesting cars have been entered by private owners—Frank P. Hall's Columbia, George F. Whiting's Winton, H. Clay Waldman's Pullman, John J. Loughran's Reo, T. S. Patterson's Selden, and Frank Hardart's Elmore. The remaining 19 represent sixteen of the best-known American makers, the several factories having sent on their crack drivers to capture the honors in what is in every respect the most important endurance event held in the East this year.

The official cars number seven, as follows: Chairman, National, John Aiken, driver; Press No. 1, Studebaker-Garford, Robert Yerger, driver; Press No. 2, Chalmers-Detroit, Joe Matson, driver; Press No. 3, Premier, W. Leslie Walker, driver (private car); Pilot, E-M-F, William Stark, driver; Pilot, Midland, D. C. Johnson, driver; Starter, Maxwell, Harry Walls, driver.

Shining lights among the drivers are not wanting. Billy Knipper, fresh from his Lowell victory, is out for the fourth division honors in his Chalmers-Detroit; Joe Matson, the Indiana trophy winner, is at the wheel of another Chalmers-Detroit which is carrying a bunch of pressmen; John Aiken is handling the big National Six in which Chairman Trego and several Munsey writers are traveling; Bob Yerger, one of the crew of the Studebaker which landed the Philadelphia-Savannah mud-plug a couple of years ago, also has a bunch of Fourth Estate men in his Studebaker-Garford; Walter Wood, American Simplex; Billy Soules, Croxton-Keeton; Leo Shaab, Renault, and Frank Hardart, Jr., Elmore, are others who have made records on road and track, and who are out for the honors in their respective classes.

The contest is being run under class A of the A. A. A. rules for 1909, and the cars are divided as follows:

DIVISION 1 ($850 and under)—Ford, 7; Hupmobile, 29.
DIVISION 2 ($851 to $1,250)—Maxwell, 9; Reo., 26.
DIVISION 3 ($1,251 to $2,000)—Washington, 5; Pullman, 12; Crawford, 24; Washington, 31; Washington, 32; Pullman, 37.
DIVISION 4 ($2,001 to $3,000)—Chalmers-Detroit, 1; Maryland, 11; Spoerer, 14; Columbia, 15; Croxton-Keeton, 17; Corbin, 18; Winton Six, 20; Marmon, 30; Selden, 34; Elmore, 36.
DIVISION 5 ($3,001 to $4,000)—Pullman, 13; Croxton-Keeton, 16; American Simplex, 21.
DIVISION 6 ($4,001 and over)—Matheson, 27; Renault, 28.

The cars were sent away this morning in the order named, with the exception of the disabled Matheson, and this procedure will obtain throughout the entire run. To-day's running time being over nine hours (195.3 miles), the first division cars were given 100 minutes' leeway over the big fellows in the sixth division. The second division pair were accorded 80 minutes excess time; third division, 60 minutes; fourth division, 40 minutes, and fifth division, 20 minutes.

How the Cars Arrived at the Quaker City

PHILADELPHIA, Sept. 21—Of the 25 cars which started this morning on the first leg of the Munsey reliability contest, all reported, and it is believed that but one time penalty will be inflicated—a better indication of the quality of the roads covered than paragraphs of description. The one exception was a 3-point penalty on the Winton Six, due to a balky motor. With the exception of a few stretches between the capital and Baltimore and the miserable cobble-paved streets of the latter city, the going, for the distance, would be rated as excellent. Little difficulty was experienced, even by the small fellows, in maintaining their schedule; in the majority of instances they could have finished clean as regards time, even without their handicaps. Penalties for work on the road, however, were so plentiful that the committee at midnight was still wrestling with the figures.

Despite the excellent going, tire troubles were numerous; but as the rules give the contestants credit for time spent in tire repairs, no damage resulted.

Only one foreign car is in the run, Leo Shaab's Renault, which was among the first at every control, and finished right after the pacemaker at to-night's control.

The Detroit electric, one of the non-contesting cars, left Washington several hours before the contestants, and, making a very fast run, was the first car to reach Baltimore. The distance between the two cities was covered in one hour and fifty-six minutes.

Quaker City, Philadelphia and Century clubs are having "open house" to-night, and the visitors are having the time of their lives. The Quakers have put on a smoker and vaudeville show at the Hotel Walton, the official headquarters.

TABLE OF FIRST DAY'S PENALTIES

First Division—(7) Ford, 1.7; (2) Hupmobile, 2.0.
Second Division—(9) Maxwell, 0.26.
Third Division—(5) Washington, 2.0; (31) Washington, 1.0.
Fourth Division—(1) Chalmers-Detroit, 2.0; (14) Spoerer, 3.0; (15) Columbia, 1.0; (16) Croxton-Keeton, 5.0; (20) Winton, 1.1; (34) Selden, 2.0.
Sixth Division—(27) Matheson, 4.0.

Note—All other cars went perfect, except for the single time penalty imposed on (20) Winton, 3.0 points for late start.

Automobile Wheels, Rims and Tires

By Thos. J. Fay

IN a discussion of the action of road shocks upon an automobile wheel, it is possible to draw a very close analogy to the action of a hammer striking a series of blows upon an anvil, and the reaction of the same. To carry out the comparison, glance at Fig. 26, which represents an anvil and a series of hammer blows upon the same. This might be any kind of an anvil and, similarly any sort of a hammer. In each and every case, the distance, which the hammer will rebound, after the anvil is struck, depends upon the part of the anvil struck. As the figure shows, if the anvil is struck fairly at the center the hammer will rebound the greatest distance, because the blow will be against the greatest section of the anvil and the motion will be arrested quicker. It is not the weight of the hammer that counts so much as it is the time (or distance) in which the motion is arrested. Out on the horn, for illustration, where the anvil is far less rigid, the rebound of the hammer is reduced very much, and transferring this same idea to a wheel renders it obvious that short spokes will act just as the center of the anvil, and very long spokes will perform just the same as the horn of the same. The energy of impact then may be much or little, merely depending upon the diameter of the wheels, just as it is in the case of the anvil, depending upon the point of contact of the hammer, in view of the rigidity of the section of the anvil.

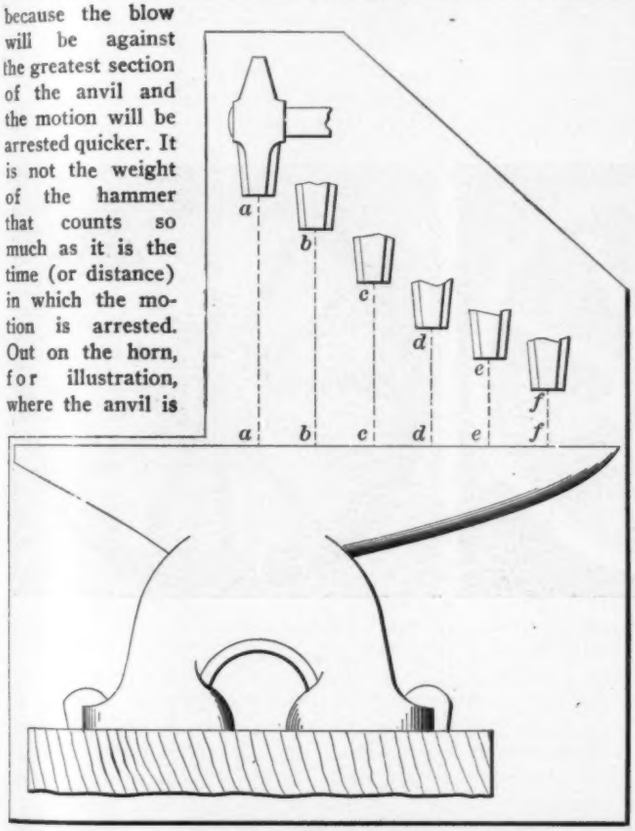


Fig. 26—Anvil and hammer blows, showing principle of arrested motion and impact

It is on this account that high wheel automobiles are enabled to make good speed on roads of no great pretense, although pneumatic tires are not taken advantage of, and even the solid tires used are of small sectional area, because it has been found that the spokes of the wheels, they being of considerable length, and limiting the rubber serve the treble purpose of lowering the cost, reducing weight and eliminating bouncing effects.

The modern tendency in pneumatic tire work is in this same direction, and it is self-evident that long spokes, if they hold resilient qualities, have the further advantage of low cost and long life.

Importance of Service Tests—These must be relied upon to tell the real story in the long run, excepting that certain selections of wood for illustration, foreshadow success, or failure,

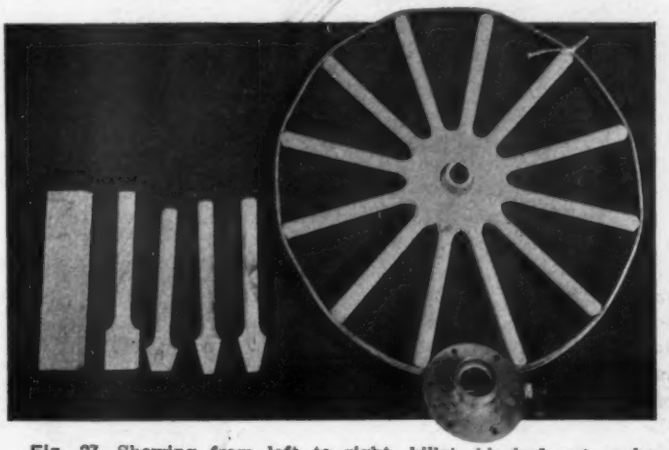


Fig. 27—Showing from left to right, billet, blocked out spoke, finished spoke, scrap, and one with a rusty streak, besides a set ready for the felloe

from the start. Fig. 27, which is reproduced from a photograph taken at the plant of the Pierce-Arrow Motor Car Company, at Buffalo, presents all the elements of success or failure, side by side. The billet of wood, at the left, as accepted by the makers, is sawed from second growth hickory of the variety as found native to Missouri, after the trees are felled green, cut into lengths, corded, weather seasoned, and then cut into billets, from which spoke stock is carefully selected and the ends painted to prevent checking.

A roughed spoke along side of the billet, in the same figure, indicates the second operation, and when the spoke is thus blocked out, it is possible to ascertain if it will be good enough

Fig. 28—Reproduction of wood from a broken wheel, showing heart wood, slightly discolored, regular grain, and evidences of strength

Fig. 29—Depicting part of a broken wheel with more uniform grain and no discoloration whatever

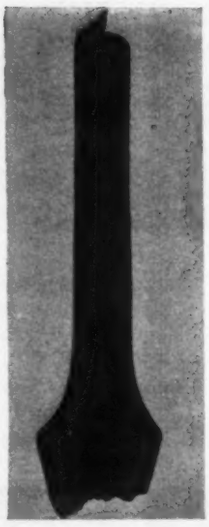


Fig. 30—A dead wood spoke which failed in service

for wheel work of the first class. If knots uncover, or if the grain crops out, even though the wood may be close, of good color, and free from blemishes in the main, it will be necessary to condemn the spoke. The next operation is to miter the spoke, which is done on a machine, so that accuracy is a matter of setting the same to give the required facing angles. The third from the right in the figure shows just such a spoke sufficiently perfect as respects quality of the wood to be used in a Pierce car, but the fourth spoke proved to be of the "bastard" variety, so-called, since the grain cropped out part way up from the miter end. The fifth spoke shown is free from all but a color imperfection. This streak might not do harm, but the wood looked somewhat soft and punky and since spokes are subjected to torsion under some conditions, this imperfection might result in a split spoke in service.

The set-up woodwork shown to the right represents a set of spokes of a wheel just after they were drawn up, and the miter joints are so close that the seams are scarcely noticeable. The glue used is of the finest grades obtainable, and by repeated tests it has been found that joints so made, if the miter angle is correct, are stronger than the cleavage section of the wood. This condition is fortunate since it permits of handling the built-up woodwork in the after operations, and allows of retaining all the bearing surface of the spokes, on the ends, against the barrel of the hub, in service.

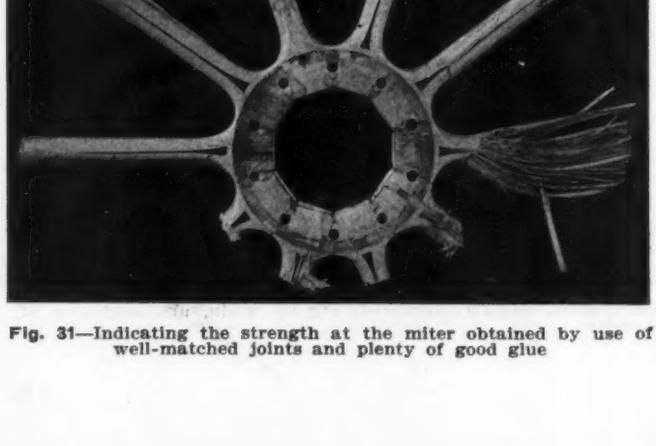


Fig. 31—Indicating the strength at the miter obtained by use of well-matched joints and plenty of good glue

What an Actual Service Test Indicates—The broken wheel, Fig. 28, shows a discolored condition of the wood, and while discoloring may not of necessity portray a condition of lowered strength, even so, the chances of attaining the best results are reduced. True, all the spokes illustrated (excepting Fig. 30) were in wheels that were in collisions or other violent wrecks, and they would not be expected to survive no matter of what material they may have been made. Fig. 29 represents just a little advance, since the wood is a little more uniform in all respects and quite free from discoloration.

Fig. 30 represents a spoke which cannot be regarded as of any value in automobile wheel making, and the Pierce wheelwright, Mr. Johnson, took it as a souvenir from a wheel that failed on small provocation, and in discussing the matter, very aptly brought out the fact that when wheels are painted it is extremely difficult to ascertain just what kind of wood may have been used. The spoke is of greater section than that customary in Pierce, and other cars of quality, and is a good illustration of the futility of size if the material is defective.

Fig. 31 depicts a wrecked wheel, which came from a car that was struck by a locomotive, and it shows to a nicety how well the glued joints will hold when they are well made. In Fig. 32 there is a chance to notice a certain amount of variation of wood even when selections are made by men of skill, although, in this example, it must be admitted that the wheel probably would have outlasted the rest of the car had it not been in a violent collision. Fig. 33 also, of a wheel that went through usage which wrecked the whole car, is a normal example of the grades of wood used in the Pierce plant, and this example affords an excellent opportunity to ascertain just how second growth hickory performs.

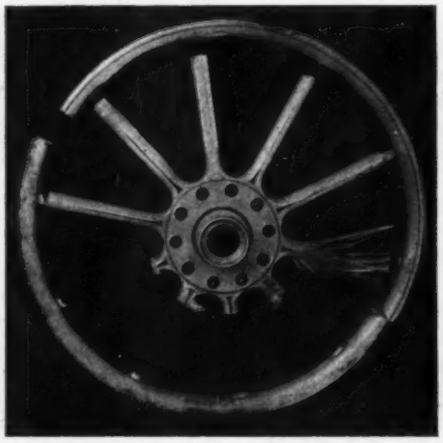


Fig. 32—Evidence of the changing strength of wood in the several spokes even with the very best of selection

Fig. 33—Illustrating a wheel of great strength with uniform wood as selected by the Pierce wheelwright

Modern Methods of Building Wheels—When the felloes are put on, the wheels have to be trued up and it is of the greatest importance that this operation be performed with the same precision as that attending the truing up of a flywheel. The machine used for the purpose has all the elements of accuracy and by its use the work is done expeditiously, while the personal equation is eliminated.

With the wheel trued up, after the felloes are in place, the wood work is then ready for the rim, and in the setting of the same there is ample opportunity to ruin the wheel. In the old way, the rims are put in a fire and heated up to almost a dull red heat to expand them sufficiently to slip over the felloe with ease, and when they are cooled off, by sprinkling water over the wheel, the dry wood, just as it comes from the kiln, is in a

condition to lap up water at a rapid rate. The water, so absorbed, will swell the wood, and when the wheels are painted the water will be locked in, there to remain for some time, probably until the wheels are allowed to stand out in the heat of the sun for a few hours. After this the wood will distort, the miter may open up, and on the whole it is scarcely possible to make a wheel of the first class if water is allowed to contact with it after the wood is kiln-dried and before a protecting coat of paint is applied. It must be understood that it is the proper function of the paint to keep water out and not to lock it in.

In the Pierce plant, in order to avoid such difficulties and to realize a more uniform pressure when the rim is applied, a hydraulic press, as shown in Fig. 35, is used in the manner as follows:

The rim is heated to a temperature which will scorch paper when it is in contact, and in this heated state it is set into place with the wood wheel, on the platen of the press. The diameter of the rim is slightly less than the diameter over the felloe, so that, even when the rim is heated, it will have to be pressed over the felloe. The work is so carefully done that the pressure is nearly the same with all wheels, and in a number of cases which the author noted the pressure ran up from 25 to 60 tons.

When the rim cools, which it is allowed to do in the open air without the use of water, it contracts, and, as a result, besides the pressure of about 25 tons, there is the pressure due to contracting, so that the wheel is bound together very firmly.

In these days when demountable tires are used to a great extent, the stationary rim must be put on with more than a little care, the sectional area of the same must be adequate for the work, and that a press, as illustrated, represents the surest way, seems to be proven by the results attained.

(To be continued.)

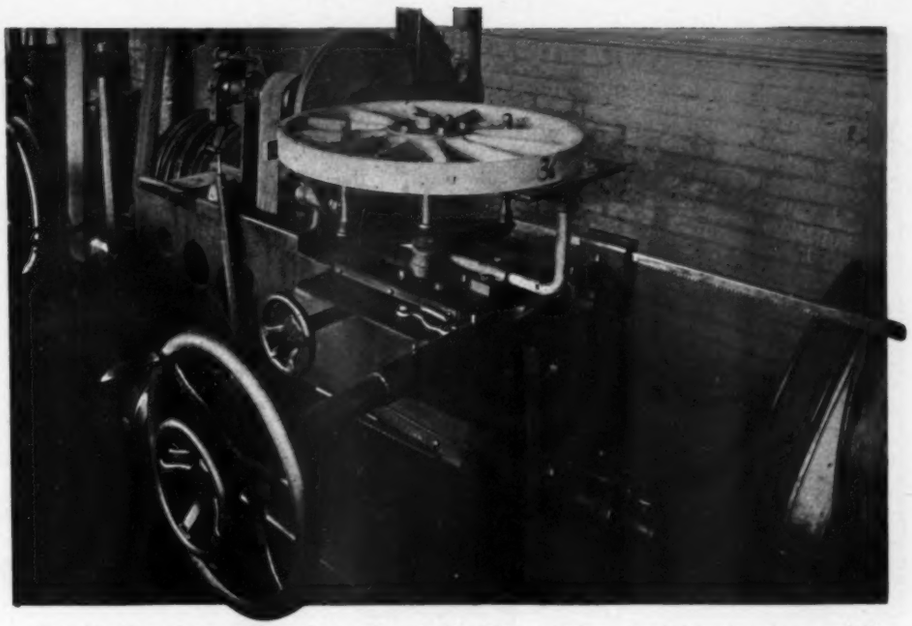


Fig. 34—How the woodwork is trued up in the Pierce-Arrow wheel department, a rapidly rotating emery wheel being used to do the work

SPRINGS OFTEN CAUSE NOISE AND TROUBLE

Springs should be examined occasionally, and while often overlooked, this seemingly trifling matter has a direct bearing upon the smooth, easy running of the car. Owing to the fact that the springs are exposed to the weather, rust is very likely to occur at this point and to this unsuspected corrosion is often due the occasional "squeak," which my garage experience tells me is not always followed up by the driver. Although many cars are provided with some means for lubricating the friction surfaces, many cars are not so well provided for and when rust makes its appearance along the joints there is a crying need for oil. This may be conveniently applied by placing the jack between spring and frame, and slightly opening the leaves or plates. The toggles and links should also have a little oil occasionally and when about this work it is well to examine the nuts of the clips. These nuts are prone to work loose.

The steering gear should always be given proper care and the levers, pins and joints should be kept free of dirt and well oiled. This is a very important matter and as neglect may result in a bad accident, injurious to both driver and car, this important mechanism should be given frequent and critical examination.

FRACTIONAL DISTILLATION IN TESTING FUEL

Specific gravity tells nothing worth knowing about automobile gasoline since the same is made up of a plurality of fractions of the distilling process by which the components of mineral oil are separated out. Specific gravity, if it is known, provided only one fraction is measured, will tell if the same is above, below, or a given standard. As it is, considering the real composition of gasoline (so called), the first thing to do is to separate the fractions from each other, and in the process ascertain the percentage of each in the whole. Having in hand the information of this character, it will then be possible to test each fraction, to ascertain as to its fuel value. The hydrometer will come in handy in the process of determining the density of the respective fractions in the distilling process. The distilling process is attended by much danger, owing to the explosive nature of the hydrocarbon liquids; care should be exercised, and the process should be conducted in conjunction with the use of good facilities for the purpose.

Fig. 35—Hydraulic press which forces the rims on to the woodwork after the rim has been expanded by heating to about 600 degrees C. A pressure of 25 tons may be exerted

ADVANTAGES OF SAND BLAST IN AUTOMOBILE PRODUCTION

REACHING after quality is a process which either increases cost or demands refinement, be it in the automobile or any other line of work. In a visit to the plant of the Pierce-Arrow, among the many methods employed, the process of sand-blasting stands out with more than ordinary prominence, due to the wide range of its application.

When this process of cleaning castings was first introduced it was looked upon as of value for the purpose of removing core-sand, scale, etc. It was a strictly foundry proposition then, and few were the shop managers who saw in it a method of locating defects in drop forgings and other parts of steel.

The process is simple, consisting of a source of compressed air, quantities of clean, sharp sand, a properly devised hopper and a hose fitted with a nozzle, as illustrated here. With this equipment, the workman is enabled to reach every part of a casting and clean it out. This is of the greatest importance in connection with cylinder castings, on account of the intricate cores and cramped spaces, some of which are quite inaccessible to tools of the conventional sort.

The extension of the sand-blast to other work, however, enables the workmen to clean the forgings, eliminate scale, and expose all defects such as can be discerned, once the scale is removed and the virgin metal is open to view. A weld in an axle, for illustration, which might go unnoticed otherwise, will show up with great certainty after the sand-blast has done its work. In the Pierce-Arrow plant at Buffalo all drop forgings and in fine, every piece that goes into the car, is subjected to this process, with attending advantages, which may be summed up as follows:

(A) Core-sand is properly removed so that the water system will not be clogged up.

(B) Forgings are partly cleaned of scale and tools last longer.

(C) Poor welds are discovered and deception is coped with.

(D) Parts present a more even surface and take finish better, moreover the finish stays on more tenaciously.

Workman in Garb and Mask Sanding Drop Forgings to Remove the Scale

How the Workman Is Protected from the Cutting Sand—As the figure shows, the workman must be protected when he is doing this class of work, and besides endeavoring to keep sand out of his internals, he wears mittens and a mask in order to prevent the flying sand from cutting through the skin.

Of a necessity, the work is conducted in a room, or rather department, somewhat isolated from the rest of the works. The flying sand with its natural hardness and propelled as it is by the high pressure of the air behind it would make short work of even the toughest skin. For this reason the sand blast at the Pierce-Arrow plant occupies the first part or front end of the so-called brazing building, a one-story structure 377 by 55 feet. Of this, a nearly square room is utilized. This is divided into two parts, one containing the large diameter fan and the sand bin or storage. Within the other half are placed the blast rooms proper, and a broad hall for material storage.

These rooms are three in number, about twelve feet square. In the center of each one is a sort of table upon which the work to be cleaned—for this is primarily a cleaning operation—is laid. The tables, of which the picture shows but a corner, are made up of a simple gas pipe framework, upon which are laid long narrow strips of wood resembling laths, but about eight feet long.

Over this, and having an equal size, is placed a hood which resembles the hood placed over a blacksmith's fire. Furthermore, the resemblance may be carried further, for the blacksmith hood is to remove the deadly fumes from the coal, while the hood in this case is to remove the floating particles of sand, which are equally dangerous to the throat and lungs of the operators. This upward draft is not relied upon solely, for the men wear, as the picture shows, a headgear, with glass covered openings for the eyes.

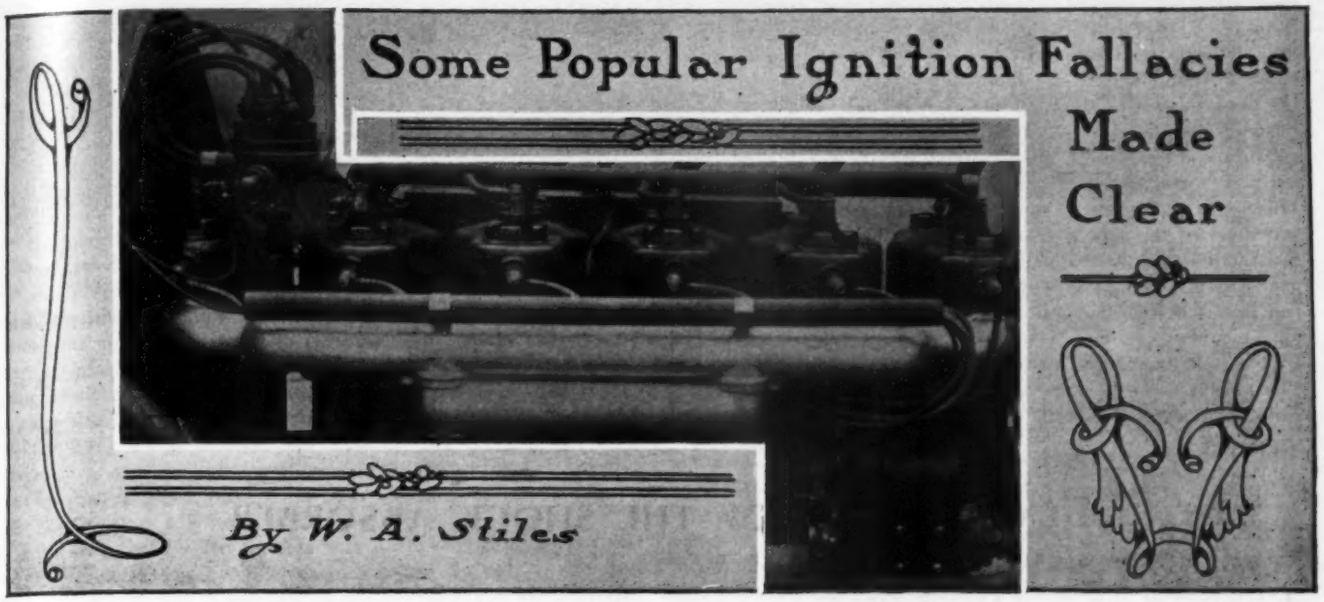
The compressed air is stored in a large tank in the corner of the passageway, this being both of large size and large capacity. A pressure of about 200 pounds per square inch is maintained therein at all times. In each of the three rooms a smaller tank holds air for immediate use, at a lower pressure of perhaps 125 pounds per square inch.

Nozzle Construction and Method of Operation—At the nozzle, there are two pipes leading in and but one leading out, the latter the nozzle proper. Of the two former, the smaller one conducts the air, which in its passage sucks the sand through the other of much larger diameter. A shut-off cock regulates the flow of air, there being no necessity for regulation of the sand, as that stops flowing as soon as the air is shut off. To go to work on a piece, it is laid on the table or bench, the workman dons his mittens and hood, brings the nozzle over to the table, turns on the air, and with the first rush of air under the high pressure, the sand is also sucked out and the work has begun. When the whole surface of a piece has been gone over to the operator's satisfaction, the air is turned off, the nozzle laid aside, and the piece removed to make room for others. Very small pieces are not laid on the table, but are held in the hand, while the blasting process is going on.

In the beginning, the blast was used, as stated previously, for cleaning castings, but by trial it was found to give to the surface of forgings a superior surface, both as to appearance, which is worth a good deal now-a-days, and as to smoothness. The latter was desirable in the paint shop, for it eliminated many hours of laborious hand work cleaning rough forgings, while the time it actually consumed was so small as to be negligible.

Thus, the paint shop savings were noticeable, so much so that this method was applied to many, if not all, of the unfinished parts which were to receive a coat of paint later. With this came the discovery that not only was the life of the painting coat lengthened on rather rough surfaces, but that smooth ones as well were benefited by its application. So, many finished parts, as, for instance, the aluminum fenders, were sent to the sand blast to receive a "roughening" treatment. The utility of the method was then not alone smoothing the surface of very rough parts, but slightly roughening the surface of highly finished ones.

Today, so much progress has the process made in these minor economies, that no American plant of prominence is without a sand blast. With the increasing number of dull finishes used this process assumes a more important place in the industry.



Some Popular Ignition Fallacies Made Clear

By W. A. Stiles

SOMETIMES amusing, and often exasperating are the experiences of the trouble man who is sent out from the factory at more or less frequent intervals and runs up against the car owner, who knows just where the trouble is, and who would have fixed it himself had he not thought it better to call in an expert. To appreciate fully the advice which is generally given him from the start of the job to its close, the trouble man should select the type of car which has its timer shaft lying horizontally along the engine base, disappearing modestly into the dark regions somewhere under the footboard. The timer is usually worn out, and must be taken off, so he will probably assume a stooping position across the frame, with head and shoulders somewhere in the vicinity of the clutch, and as he begins to skin his knuckles in getting the confounded thing off, he will listen to a rapid-fire monologue somewhat after this style:

"And after we got about fourteen miles out into the country the blankety-blank thing laid down. Yes, sir, it just quit. So I took a fine file and cut notches on each side of the vibrators to make them weaker, and when I got them back in place off she went like a top. You fellows make those tremblers too stiff altogether." (The factory man takes good care to replace those chopped-up vibrators before he leaves.) "And then you ought to have a larger whatd'yer call it on the contacts. These don't last any time; some only a couple of weeks." (He dresses them down twice a week with a file.) "It's a bum outfit anyhow; my engine gets hot now, and it didn't on my old car when I had the —— system; the steering gear is loose and the front wheels wabble"—and so on ad infinitum.

A Single Spark Will Do the Work—These delusions, however, may be set down as individual "grouches," and the same ones are seldom encountered twice. There are, though, certain fallacies which have gained ground in the public mind, and it is of these that I shall speak. The first is an idea which is being dispelled today under accurate tests, and is no longer seriously considered by scientific and mechanical men in the automobile business; namely, that a series of sparks are better than one, because a shower of sparks ignites the gas better than a single one could do, and more quickly. When it is considered, however, that an eighth or more of the explosion stroke will occur between the first and second sparks, even with a moderately rapid vibrator, it becomes evident that the second spark, as well as all subsequent ones, take place in either a flame or a hot but dead gas. The most careful dynamometer test will show absolutely no gain of power through the use of four, six or even ten sparks for each explosion. Indeed, it would seem to be a fact that the positive synchronism of the mechanical single-spark contact maker is productive of better results, speaking in terms of horsepower, than the multiple-spark system.

The next is a point which I shall touch upon very carefully, as it is an idea based on more or less (mostly less) truth, and has many adherents among motor manufacturers today. It concerns the relation of horsepower with spark heat. There is no question but what a small white thread spark, such as might be given by a broken-down coil, will give less satisfactory results than a good, rich spark, normally full in body heat, but the most careful and impartial tests have failed to show any variation of engine power, whether a good coil was used or a high-tension magneto. Laying aside the many arguments pro and con this subject, for practical purposes it is a fact that the gas mixture either explodes or does not explode, and if the latter, the explosion will be of the same heat and pressure regardless of what set it afire. It should not be inferred from this that the mixture can not be made to explode slowly or quickly, as it is a well demonstrated fact that two sparks fired simultaneously into opposite sides of the cylinder will assist materially in rapid combustion. The variation between the poorest spark which will fire a mixture and the hottest "blaze" obtainable by the use of a geared-up magneto is in any case only the smallest fraction of a horsepower, and the motorist who imagines that his new magneto will take him up a hill on high gear that he used to take on second with his old coil, is either the victim of a delusion or has had his first system improperly timed.

Gas and Ignition Troubles Much Alike—Another point which I have mentioned is the frequent confusion of carbureter and ignition troubles. This is especially frequent on two-cycle engines, where the mixture is inherently poor, and requires excellent carburation. I cannot recall how many cases of ignition trouble I have cured by an adjustment of gas and air, but there have been a great many. I have found a very safe plan to adopt in case of trouble to be to test the spark at the plugs, and if it is all right, to get after the carbureter. This will lead to the trouble nine times out of ten.

Fixed spark ignition is a practice which has been more or less tried out in the automobile field, and is considered by some to be eminently satisfactory. To my mind, however, the trifling advantage obtained by elimination of hand adjustment is more than offset by the unquestionably greater wear and tear on the engine. It is entirely impracticable with a coil system, due to the fact that the lag of the vibrators, as well as of the coil, will retard the spark more and more as the engine speed advances, and at just the time when it should be considerably advanced, it is very much retarded. This leads to heated and warped valves, boiling out of water in the radiator, and deposits of carbon, as well as the material reduction of engine speed and power. These facts apply, although in a less degree to fixed magneto ignition, and one prominent concern manufacturing taxicabs, after trying out

this system and building cabs for one year with this equipment, found it advisable to again adopt the hand control system. A very interesting discussion on this point was brought up at a meeting of the Society of Automobile Engineers last spring, and the general consensus of opinion at that time seemed to be that the advantages gained by fixed ignition were decidedly dubious.

Engine Speeds Up on Magneto?—Following along these lines of spark timing, I wish to comment on one of the most fallacious arguments I have ever heard advanced. It is the statement of the man who says: "I have just proven to my own satisfaction that the magneto gives more power out of the same gas than the coil. The way I did it was this—I let the engine run idle at a low, moderate speed on the coil, and then without touching anything else, I switched over to the magneto. The engine picked up right away, and ran at a much faster speed." The reason for this extra speed is very obvious, where the circumstances are considered. In the first place, the same advance lever operates, as a general thing, both the magneto and the timer. Now it is very seldom that the driver advances the spark as fast as it really should go. This is due to habit; he has become accustomed to carry the spark a trifle low in order that a momentary slowing of the engine shall not cause pounding. Thus it is that when the magneto is switched on, the effect produced on account of the lack of lag in magneto spark timing is to advance the spark and naturally the engine speed is increased. It is probable that the magneto would naturally increase the engine speed five to ten R.P.M. on account of the nicely synchronized spark which the magneto delivers, but the difference would probably not be appreciable.

These erroneous conclusions and assumptions without doubt have arisen from the fact that the ignition of an automobile engine is a part governed by different principles from the rest. They are, nevertheless, a very annoying factor of the ignition business, as any coil or magneto manufacturer will attest.

DEVELOPMENT OF THE SHOCK ABSORBER

By EDWARD V. HARTFORD

THE problem of designing a suitable shock-absorber for automobile springs first claimed my attention in the spring of 1899. I was in Paris at the time, and went out to Versailles to see a motor tricycle race. More interest was being taken in these than in automobiles, as they were faster. The race was won by Marcellin, beating Baras, who previously had been well established as the motor tricycle champion. When I looked at Marcellin's tricycle, a Darracq, equipped with a two-cylinder 12-horsepower Buchet motor, I noticed that the fork was entirely different from the ordinary one. Marcellin informed me that it was *la fourche Truffault* (the Truffault fork) and was a great invention. I then turned to Baras and inquired of him how Marcellin had come to beat him. He replied: "It's that Truffault fork. In my last race, which was partly over cobblestones, I used it, but as this race was over a road like a billiard table, I thought I would do better without it. However, I will never race without it again." Baras' tricycle was identical with Marcellin's, with the exception of the spring fork.

The following day I looked up M. Truffault and found him in a humble little shop located near the Porte Maillot, building the Truffault fork. He was a man of about sixty years of age, of the pure type of the inventor, creating one thing and then bending his energies on something else, not sticking to one idea until he had established it on a firm basis. From his inventions he should have been a wealthy man and long since retired from business, but instead the manual labor he was even then performing had cramped and bent his fingers. Truffault actually invented the hollow bicycle rim which first made the light safety bicycle possible. He turned his invention over to a large manufacturer of bicycles who promised him a royalty of ten francs on every one manufactured. Truffault, his mind still bent more on improvements and new inventions, failed to take the necessary legal steps to protect himself, and the manufacturer, putting his conscience behind him, became a millionaire, while the royalties which were actually Truffault's were never paid.

I had the Truffault fork applied to my own 2¼-horsepower De Dion tricycle with the most gratifying results. Truffault and I became fast friends, and worked in unison on the problem of a shock absorber for the various types of suspensions that were being used on automobiles. Truffault had a complicated idea which required a somewhat radical change in the construction of the automobile, and I suggested the simple suspension which has been used with such success to the present day.

In the fall of 1900 I went back to the United States and tried to interest some one in the invention. I bought a 6-horsepower Oldsmobile and sent it over to Truffault to experiment with, and this car was the first to be fully equipped with a set of our shock absorbers. Before this, however, I had demonstrated it with a tricycle, but could get no one to take the matter seriously. Even some of the best automobile engineers of the day could not understand why we wanted to brake the action of the spring with friction, and thought rather we should put ball bearings all around to give the spring its maximum oscillation.

One exception was Thomas A. Edison, to whom I took my tricycle at his experimental plant at Orange, N. J. There I rode up and down over a series of 150-pound castings about eight inches in height. Mr. Edison seemed very much impressed, and it certainly looked as though he intended taking it up. However, I waited for days to hear from him in vain. A little later I met the New York manager of a large automobile company, and through him obtained permission to make a demonstration at their factory. As this seemed the turning point in the career of the shock absorber, I considered the circumstances of sufficient importance to go to the expense of bringing Truffault over from France. He remained at the factory for two weeks, as it was necessary to change the very stiff springs with which the car was equipped to a more supple set. When the job was finished and the shock absorbers applied, the factory testing force gave them such a try-out as few shock absorbers have received since, and Truffault assured me that he never again cared to go through the same experience. However, the demonstration was very successful, and a short time afterward the company made me an offer of $1,000 for the patent. Naturally we declined the offer.

The automobile industry in France at that time was much further advanced than in the United States, and shortly after Truffault returned to Paris he made arrangements with the Peugeot Company to exploit the invention. The Peugeot Company put them on its own cars and sold a few sets besides. The increase in the marketing of the device was very slow, however, until the late Leon Théry became interested and decided to equip his Richard-Brasier racer with them. He won a sweeping victory in the Gordon Bennett race that year, although his car was the smallest entered, and naturally the shock absorbers received much credit. Théry was able to pass over all road obstructions without shutting off his power, while the others were obliged to slow down materially.

At once all the racing drivers rushed to Peugeot to have their cars equipped with the shock absorbers, and from this time the business went on with rapid strides. In this country we placed an initial order for 25 sets with the Garvin Machine Company, and after this had been duplicated twice we opened a small shop on Hudson street, New York, in October, 1903. By May of the following year we were running night and day to supply the demand, and conditions have hardly changed since. Numerous imitations have sprung up, but at the start we had patented every deviation of the idea and were fully protected.

TEST OF PIERCE WATER-COOLED MOTOR*

By J. A. Luhrman and G. W. Woodward

IN all of the tests the air valves, both main and auxiliary, in the carbureter were controlled by the throttle only. The gasoline needle valve, however, was adjusted for four different positions in the runs at 10, 15, 20, 25 and 30 horsepower at 1,000 and 1,250 r.p.m. The first setting was obtained by shutting the gasoline supply down to a minimum, and still carrying the load without back-firing. The fourth setting was with the maximum amount of gasoline possible, but sufficient for carrying the load. Between these two extremes two points were taken. By this means the range of the carbureter for the correct setting of the auxiliary air valve was determined.

It was intended when the test was started to make an analysis of the exhaust gases and also to measure the air to the carbureter, but owing to an unexpected shortening of the time allowed for the test we were unable to do this.

As we had started on quite a long series of brake tests, we finished these first and then spent what time we had remaining working on the manograph. We obtained very satisfactory results for all runs except at maximum horsepower; then the manograph became troublesome and the cards taken were not satisfactory. However, the results taken were worked up and put in the thesis, more to show what would have been done if time had permitted than for any other reason.

The runs at maximum horsepower were made with the needle valve of the carbureter set for maximum power which could be developed at that speed.

Previous to the tests, the valves of the engine were all checked over to see if they were timed correctly according to the figures given us by the makers. The valves were all timed so that they opened correctly and the closing was allowed to come where it would, as by several trials this seemed to be the best method to follow, since both adjustments could not be made on account of the cams.

A storage battery was used in all runs as the source of current for ignition, as the magneto did not seem to be able to operate reliably with a heavy load and high speed.

Method of Tests for Horsepower at 1,000 and 1,250 Revolutions—The tests were started as soon as possible after the engine was running under required conditions. On the first signal to start the test the gasoline gauge was read and the speed-counter snapped into place. The temperature of the jacket water in and out was also recorded. All readings were taken every two minutes and the speed-counter was always read exactly on the signal. The required brake-load was kept "floating" and the speed shown by the tachometer was used as a check on the reading of the continuous speed-counter.

Method of Testing for Maximum Horsepower—Five men were required for these runs, the fifth man reading the brake beam on a signal from the man taking the speed with the tachometer. The engine speed was kept constant by means of the brake, with the throttle wide open and the spark adjusted for the best results. In other respects, the runs were similar to those for varying horsepower at constant speed.

The main computations on each run were checked and compared as far as possible between the runs with the results of previous runs. Whenever a run appeared to differ to any extent from runs previously made, check runs were made, until the error was found or two similar runs checked. It was found necessary to make a number of check runs, especially at high horsepower and low settings of the needle valve of the carbureter.

Mounting of Engine—The engine was mounted upon a wooden frame and all of the necessary connections, such as water, electrical and gasoline, were made. The water supply was obtained from a tank which discharged the hot water through an overflow outlet near the top and the makeup water taken from the city mains. With this arrangement, by increasing or decreasing the amount of cold makeup water, the temperature in the supply tank could be maintained very nearly constant at any desired temperature. During the test, temperature of the jacket water was kept at a very nearly constant temperature and at such a temperature as would most nearly approximate the conditions of actual practice. The pump for circulating the water was calibrated under conditions of use so that the quantity of water circulated at any given speed could be approximately determined from the calibration curve. The water into the jacket was taken from the bottom of the supply tank and the discharge water was taken in at the top of the tank. The temperature of the cooling water "in" and "out" was ascertained by means of thermometers inserted into oil wells that were placed in the piping of the circulating system. The fuel was fed to the vaporizer by gravity. The weight of gasoline used during each run was determined accurately. The load was applied to the engine by means of a Prony brake. The flywheel was provided with a wide flange around the inside for the purpose of keeping a certain amount of water in the wheel and was kept cool by running cold water into it. The hot water was carried off by means of a scoop arrangement. The most satisfactory lubricant that was found for the brake was a rind of bacon or ham. By placing some of this lubricant between the wooden blocks of the brake so that it came in contact with the warm rim of the flywheel, the proper lubrication to give good results was obtained, for as the flywheel heated up, the grease ran more freely and so a balance was obtained, making it possible to keep the scale beam in very nearly perfect balance all the time.

All the runs were of 30 minutes' duration excepting for a few heavy loads, when at times the runs were made shorter, because of conditions at the time of the test. Readings of all data were taken in every case at two-minute intervals. A continuous counter was used to take the speed, and this was checked by means of a tachometer.

To start a run the engine was put under load and brought up to speed as shown by the tachometer, and conditions were allowed to become constant. At a signal from the timekeeper, the continuous counter was snapped into place by means of a spring and readings were taken of all values. By this method of procedure any error that might be introduced by the suction of the engine upon the fuel tank was canceled. The specific gravity of the fuel was tested for each new lot of gasoline placed in the tank. Mobile oil was used in the lubrication system and gave very good results.

During the test the engine was run without a muffler, owing to the long exhaust pipe used; it was thought that this would have practically the same effect as the muffler. The exhaust pipe, or manifold, on the side of the cylinders became very hot during a run at heavy loads, and this was cooled by means of an air blast from an electric fan which was temporarily mounted on the engine frame beside the exhaust manifold.

The temperature of the jacket water was kept as far as possible constant at 110 deg. Fahr., to obviate any changes in thermal efficiency due to the variation of the jacket water tem-

* Paper read at semi-annual meeting, Society of Automobile Engineers, Chicago, August 5-7, 1909.

perature; it was found that this temperature affected the results to quite a considerable extent.

The object of the test was to ascertain the following:

1. The fuel consumption and the economic thermal efficiency at constant speeds and varied horsepower output at various settings of the needle valve in the carbureter.

2. The fuel consumption and economic thermal efficiency at the maximum horsepower output and varied speeds with respect to the needle valve settings.

3. The mechanical efficiency and maximum compression pressures from the manograph cards.

4. To ascertain the fuel consumption for a slow no-load run.

Some Details of the Engine—The engine under test was made by the Pierce-Arrow Motor Company, of Buffalo, N. Y. It is of the vertical type, six-cylinder, water-cooled. Both the inlet and the exhaust valves are mechanically operated by means of gear-driven cams and lifting rods. The cylinders are cast in pairs and have a bore of 3 15-16 inches and a stroke of 4 3-4 inches. The water-jacket valve chambers and cylinder heads are all cast integral with the cylinder proper. The inlet valves are located on one side of the cylinder and the exhaust valves on the opposite side. The springs closing the inlet valves are weaker than those on the exhaust. All the valves are interchangeable and have cast-iron heads with 45-deg. seats and steel stems. They are operated by two sets of cams on separate camshafts, both located within the crank chamber. The push rods operating the valves are fitted at the lower ends with hardened steel rollers of large size and moving in renewable bronze guides.

The pistons, which are accurately ground, are made very light and with webs to strengthen the wrist-pin lugs. They are fitted with four piston rings.

The wrist pins are of nickel steel, case-hardened and ground, and are fastened to the wrist-pin lugs by means of taper-set screws.

The connecting rod is of the marine type, forged of steel and fitted with phosphor-bronze bushes at both ends. The wrist-pin bearing is made extra long. The crank-pin bearing is adjustable for wear.

The crankshaft is a solid forging of nickel steel and is supported on seven bearings which are provided with adjustable bronze bushes. Both the crank-pin journals and the main crankshaft journals are of liberal length and diameter, to insure cool running and long wear, and they are accurately ground.

The crankcase is cast of very tough aluminum alloy in two halves, being divided in a horizontal plane through the center of the crankshaft. All the crank bearings are entirely supported by the upper half of the casing and the lower half acts only as a dirt cover and an oil well. When the latter is removed, free access is obtained to all the crank bearings for inspection and adjustment.

The camshaft gears are located at the forward end of the engine, outside the crankcase, and are protected by a special oil-tight cover bolted to the crankcase.

The magneto spark-plugs are screwed into the side wall of the inlet valve chamber and the battery spark plugs are screwed into the top of the cylinder near the inlet valve opening.

How the Lubrication Was Effected—Lubrication is effected by means of a gear-driven oil pump located on the exhaust side of the engine. It is operated by a worm gearing on the camshaft. This pump draws the oil from the pit in the crankcase and forces it into the reservoir placed immediately above the exhaust pipe. From this reservoir a copper tube leads to each of the crank-shaft bearings. There is a removable wire gauge screen in each of these pipes to remove any sediment that may collect. The crankshaft journals and the short arms of the crank are drilled through their centers and the crankshaft is also provided with radial holes at the center of the journals so as to provide a passage for the oil from the main journal bearings to the crank-pin bearings. There is a continuous flow of oil from the reservoir to all the bearings on the crankshaft, the oil being carried from the main journals and forced to the crank-pin journals by centrifugal force. The oil that works through the outer crankshaft bearings returns to the bottom of the crankcase from where it is again pumped up into the reservoir.

In cold weather the oil in the reservoir is kept warm and its fluidity increased by its nearness to the exhaust pipe. This also admits of a heavier and more viscous oil than when it is not heated.

The shape of the oil tank is such that no matter whether the car is going up hill or down all the bearings get an equal amount of oil. The makers claim to have had very good results from this system of oiling, and from what could be observed during the test, the system worked very well.

All About the Cooling System—The cooling water is circulated by means of a water pump of the centrifugal type, which gives a large flow of water through the jackets of the cylinders. The pump is attached to the engine crankcase, being positively driven by means of a gear, meshing into the exhaust camshaft gear wheel. The supply for the pump is taken from the bottom of the radiator and delivered into the water jacket of the engine at its lowest point. From the top of the jacket the water returns to the top of the radiator.

Venturi Type of Carbureter—The mixture to this engine is supplied by what the makers term "Our special automatic carbureter." It is of the Venturi tube type. The constant level gasoline chamber is concentric with the spray nozzle. This is in communication with the main gasoline supply tank. The float is of annular design and keeps the height of gasoline at the spray nozzle constant. This height is 3-16 inch below the top of the nozzle, the opening in which is regulated by means of a needle valve. The gasoline from the supply tank passes through a fine gauze strainer, which prevents water and dirt from entering. When the engine is running slowly, the throttle valve is just open and the auxiliary inlet reed valves are on their seats. The opening formed by the throttle valve is V-shaped, so that the suction of the engine induces a high velocity at this point. All of the air is taken in at the lower inlet and, coming from the proximity of the exhaust pipe, is warm. It passes up the contracted passage around the spray nozzle at a high velocity and vaporizes the proper amount of fuel. When the engine runs faster, the more intense suction opens the light auxiliary air reed valves, and when running still faster it opens the heavy reed valve also. This, it is claimed, insures a gradual increase in the supply of air to the mixing chamber. The entire mixing chamber is surrounded by a hot water jacket. The supply pipe to the jacket has a cock in it, which can be closed in hot weather, but should be full open in cold weather to secure the best results.

Two Independent Ignition Systems—The ignition of the engine is supplied by two independent systems, as shown by the diagram, Fig. 4. One system consists of a storage battery and individual induction coils. The spark plugs for this system are on top of the cylinders. The timing by this arrangement is effected by a commutator of the roller type and is placed on a vertical shaft between the second and third cylinders. The revolving roller is operated by means of a pair of bevel gears from the inlet camshaft. The order of firing of the cylinders is 1, 5, 3, 6, 2, 4.

The other system consists of a Bosch high-tension magneto. In this magneto, a shuttle armature rotates between the poles of two pairs of strong steel magnets. The rotation of this armature in the strong magnetic field results in the induction in its winding of a strong electrical current which reaches a maximum voltage twice in one revolution, or after rotating through an angle of 180 deg. The current which is produced by turning the armature rises by short-circuiting the primary circuit through a contact breaker and breaking the circuit at a suitable moment. A spark jumps across the electrodes of the spark plug at the moment of the breaking of the primary circuit, causing the explosion in the cylinder. As the arc-like spark

can only be produced when the armature is in a certain position and also the ignition has to take place at a certain period during the movement of the piston, it is necessary that the armature shall be positively driven. In the case of a six-cylinder engine, it must rotate at one and one-half times the speed of the crankshaft. The armature is wound in two parts; one is a primary winding consisting of a few turns of heavy wire and the other is a secondary consisting of many turns of fine wire. The end of the primary winding is connected to the secondary so that the latter is a direct continuation of the former. The end of the secondary winding leads to a slip-ring, on which slides a carbon brush, which is insulated from the magneto frame. From the brush, the current is conducted to a connecting bridge fitted with a central carbon brush, and through the rotating distributor piece which carries a radial contact carbon to the distributor disk. In the distributor disk are embedded metal segments, of which there are six. During the rotation of the contact carbon, the latter makes contact with the respective segments and always connects the secondary with one of the contacts. Connected to the segments are sockets which serve for the reception of the contact plugs. These plugs serve as terminals for the cables leading to the spark plugs of the individual cylinders. From the end of the secondary winding the high-tension current is led to the respective cylinders, which are fired alternately; the current produces the arc, which causes the explosion, then returns through the motor frame and the armature core and back to the beginning of the secondary winding.

Manograph and Connections—The manograph used in these tests was a Hospitalier Carpentier, made in Paris, France. The position and arrangement of the manograph and connections are as follows: The manograph was mounted on a tripod at the side of the engine and protected from vibration by being fastened by strong wire to the floor. A flexible shaft, screwed to a stud inserted in the brake wheel hub, was led to the manograph. The shaft was supported by a bracket attached to the frame on which the engine was mounted. The try-cock in the top of each cylinder was removed and the hole thus made was fitted with a special fitting, to which was connected the tube to the distributing block. One-sixteenth extra heavy copper tubing joined each cylinder to a brass distributing block. The gas distributing block is made of a bar 1 inch square and 4 inches long. The block was fitted with seven cocks and one brass union. One cock was to give atmospheric pressure and the other six were connected to the cylinders, the idea of the design of the block being to reduce the gas volume as much as possible and to have an equal distance from each of the cocks to the inlet leading from the manifold.

A 1-8-inch ground brass union was used on the top of each of the cylinders and the ends of the copper tubes were silver soldered into the unions. The other ends of the copper tubes were silver soldered into the cocks on the distributing box. An electric fan fastened to the wooden frame of the engine cradle was used to keep the exhaust pipe and the copper tubes cool.

The connection between the manograph and the distributing block was made by a short length of tubing; all bends in the tubes were made easy so as to cut down friction, and, by having the length of all the tubes the same, to have equal friction in each tube. All passages could be shut off at the block by the system of cocks used. When a cylinder was being indicated the cock on the block was opened, giving direct communication to the manograph, with a very slight increase in volume beyond that of the tubing itself.

Principle of the Manograph—A beam of light from a small arc light is reflected by means of the prism so as to fall on a concave mirror, which in turn reflects the beam on a ground glass screen. The mirror frame receives a motion from the engine which causes the beam of light to trace a horizontal path on the ground glass, while a vertical motion of the beam is produced by the action of the gas pressure on a diaphragm, which is connected to the mirror. The resultant of these two motions gives an indicator card.

Manograph Details—The flexible shaft comes up underneath the front of the manograph and terminates in a small gear. Another gear of the same size meshes with gear. The bearing for the first gear is in a brass worm gear, which may be revolved by means of an adjusting screw around the second as a center. It is thus made possible to produce a rotation of the one gear, while the other remains stationary. In this way the position of the shaft relative to the beam of light can be changed.

A small stud is fastened in gear which acts as a crank and is connected by a short link to the lever, which is pivoted to the frame near its center. The free end presses against a short pin, which in turn presses on a horizontal leg of the mirror frame. The mirror is supported on a right-angled frame which rests on three points. The point at the apex of the frame is stationary and acts as a pivot on which the frame rocks. The vertical leg of the frame rests against the pin which is in contact with the reverse side of the gas pressure diaphragm. Considering one of the pins stationary, any motion of the other pin will produce a rocking motion on the fixed pivot and the stationary pin. By means of these two motions at right angles to each other there is produced a resultant motion of the mirror frame about the fixed pivot. The mirror frame is held against the three pins by means of two strong, flat springs. The frame of the mirror and the connecting mechanism were made of hardened steel to reduce the wear and they were also of very light construction, the latter to reduce the inertia effects. The mirror is ground concave with its focus at the ground glass screen.

The gas diaphragm is a circular plate of thin steel supported at its circumference by being pressed against a ground seat by means of a brass plug. The plug is cut away, leaving a recess connecting with the tube from the distributing block. As all the joints are ground, the recess is airtight. A small hole is drilled back of the diaphragm into the recess to keep the pressure atmospheric.

This mechanism described is fastened to one end of a wooden box, the glass screen being at the other end. On one side of the box near the screen end is screwed a tube, supporting on the end inside the box a small ground-glass prism. The axis of the prism is vertical and is fitted with a small rod for adjustment if desired. On the other end of the tube is placed a framework supporting a small hand-adjusted direct-current arc light. Inside the tube, a tube of small diameter is placed, having the outer end closed by a diaphragm, through the center of which is drilled a very small hole. On the outside of this diaphragm a small shutter was arranged so as to screen the hole. The shutter was fitted with a spring so that the hole was nominally closed except when a card was being taken. The shutter was operated by a card. Adjustments were provided so that the center of the arc could be kept in the same horizontal plane and in line with the hole in the diaphragm. The plate holder was held in place by a brass spring. Direct current at 110 volts was used to supply the arc light, the power regulation being obtained by a bank of 16-candlepower lights connected in parallel with each other, but in series with the line.

Adjustment of the Manograph—In a proper setting of the manograph for a given speed there are two factors to be considered—first, the lag of the flexible shaft, and second, the lag of gas pressure in a small copper pipe. These were overcome by cutting the spark off of one cylinder and indicating the resulting cycle by means of a weak diagram (5 kilograms). The instrument was then adjusted until the maximum point of the compression line accrued at the end of the stroke, as determined by the horizontal travel of the beam of light. The expansion line retraveled as nearly as possible the compression line, as seen by the lines on the ground-glass plate. The speed was kept constant at the desired number of revolutions during the setting.

Taking of Indicator Cards—The beam of light as thrown on the ground-glass plate was photographed on stiff bromide paper inclosed in a double plate holder. A small shutter similar to that on a kodak was fitted to the diaphragm in front of

the arc light and actuated by means of a card. A dark room was used which was situated in the gas-engine laboratory and provided with all conveniences. All the cards were developed immediately after being taken, so that duplicates could be made if necessary. In taking cards the manograph was adjusted as described above, then a 25-kilogram diaphragm substituted for the 5-kilogram diaphragm and a cylinder indicated and cards photographed.

Method of Obtaining M. E. P. Cards—Cards were all planimetered and the mean ordinate determined by dividing the area by the length. The mean ordinate thus obtained was scaled off by means of dividers on the calibration curve corresponding to the diaphragm used. The mean effective pressure determined by this method was reduced to pounds per square inch by multiplying by 14.22, and this mean effective pressure was found on the abscissa of the curve showing the indicated horsepower per cylinder against mean effective pressure in pounds. Going vertically upward on this sheet until the line corresponding to the speed in consideration is reached, then across the sheet horizontally, the indicated horsepower may be read directly. This series of curves was computed from the constants of the engine.

Gasoline Analysis—The gasoline used in the test was analyzed by Dr. Lundell, of the Department of Chemistry, Cornell University. The sample analyzed was selected by taking numerous samples of the gasoline from time to time out of the bottom, middle and top of the gasoline tank, then thoroughly mixing them.

The heating values as determined by a Junker calorimeter were as follows:

Higher heating value = 19,798 B. T. U. per pound.

Lower heating value = 18,700 B. T. U. per pound.

Sample Computations for Run No. 1—10 horsepower at 1,000 r.p.m.

Gasoline consumed in 30 minutes = 4,320 cubic centimeters.

Specific gravity = .705.

Since 4,320 cubic centimeters of gasoline were used and 1 cubic centimeter = .061 cubic inch, therefore, $4,320 \times .061 = 264$ cubic inches used.

As the hydrometer was calibrated with water at 60 deg. Fahr., and the weight of 1 cubic foot of water at 60 deg. Fahr. = 62.37 pounds, then the weight of gasoline = cubic inches × specific gravity × weight per cubic foot water ÷ 1,728 =

$$\frac{264 \times 62.37 \times .705}{1,728} = 6.72 \text{ pounds.}$$

B.t.u.'s supplied per hour = pounds of gasoline used × lower heating value of gasoline =

$$6.72 \times 2 \times 18,700 = 251,000.$$

Thermal equivalent of 10 horsepower.

$$\text{H. P.} \times 2,545 = 10.016 \times 2,545 = 25,460.$$

Thermal efficiency =

$$\frac{\text{Thermal equivalent of work}}{\text{B. T. U. supplied}} = \frac{25,460}{251,000} = 10.15 \text{ per cent.}$$

Pounds of gasoline per 1,000 revolutions of motor = pounds of gasoline used ÷ total revolutions × 1,000 =

$$\frac{6.72 \times 1,000}{30,050} = .2235 \text{ pounds.}$$

The volumetric efficiency from the card was determined by measuring the distance between the points where the compression and suction lines cross the atmospheric line, and dividing this distance by the total length of the card. The average volumetric efficiency from the cards of the six cylinders was taken.

The indicated horsepower of the engine was found by taking the sum of the indicated horsepower of each cylinder.

The pumping losses = the difference betwen the indicated horsepower from the indicator card and the basic horsepower =

$$18.75 - 10 = 8.75 \text{ horsepower.}$$

Mechanical Efficiency—The mechanical efficiency is the ratio of the direct horsepower to the indicated horsepower, and in this case =

$$\frac{10}{18.75} = 53.3 \text{ per cent.}$$

Horsepower Rating of Engine—The engine tested was rated on the A. L. A. M. horsepower rating, and according to this rating was a 36-horsepower engine.

On actual test at 1,250 r.p.m., which is below the rating, the horsepower obtained at the brake was 38.25, so that the engine was thus proved to be considerably better than the rating

Other Engine Data—Flywheel diameter = 18 3-8 inches.

Flywheel width = 5 3-4 inches.

Exhaust pipe: 13 ft. of 2-inch pipe; 6 ft. of 2 1-2-inch pipe.

Range of throttle segment, 0 — 22.

Range of spark segment, 1 — 14.

Length of brake arm, feet = 3.185.

TABLE NUMBER 1

10. H.P. at 1000 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, min	30	30	30	30
Net brake scale reading	16.5	16.5	16.5	16.5
Gasoline consumed, cu. in	264	257.5	424	401
Setting of needle valve, ° open	350	360	450	540
Sp. gr. of gasoline	.705	.705	.705	.705
B. T. U. Supplied per hour	251000	245000	404000	382000
Average D. H. P	10.016	10.029	10.023	10.01
Thermal equivalent of H. P	25460	25550	25500	25475
Thermal efficiency (D. H. P.), per cent.	10.15	10.04	6.31	6.67
Total number of revolutions	30050	30087	30070	30030
Revolutions per min	1001.6	1002.9	1002.3	1001
Lbs. of gasoline per 1,000 revolutions	.2235	.2185	.3595	.340
Temperature of jacket water in	99.88	114.81	97.37	102.6
Temperature of jacket water out	115.63	128.25	112.5	117.6
Temperature range	15.75	13.44	15.13	15
Lbs. jacket water per hour	7260	7266	7266	7254
Heat loss to water per hour	114300	97700	110000	108900
Heat loss, per cent	46.5	39.9	27.25	28.5
Volumetric Eff. from card	50.8	....	....	....
I. H. P.	18.75	....	....	....
Pumping losses	8.75	....	....	....
Mechanical Eff.	53.3	....	....	....
Maximum explosion pressure	137.44 pounds per sq. inch.			

TABLE NUMBER 2

15 H. P. at 1000 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, min	30	30	30	30
Net brake scale reading	24.75	24.75	24.75	24.75
Gasoline consumed, cubic inches	325	301.5	496	416.5
Setting of needle valve, ° open	350	360	450	540
Sp. gr. of gasoline	.706	.705	.706	.706
B. T. U. supplied per hour	310000	287000	472500	396500
Average D. H. P	15.02	14.93	14.99	15.05
Thermal equivalent of H. P	38200	38000	38150	38300
Thermal Eff. (D. H. P.), per cent	12.32	13.25	8.07	9.65
Total number of revoltuions	30025	29960	29980	30075
Revolutions per minute	1000.8	998.7	990.3	1002.5
Lbs. of gasoline per 1000 revolutions	.2755	.256	.4225	.354
Temperature of jacket water in	93.75	112.3	94.75	92.38
Temperature of jacket water out	111.13	128.2	108.81	107
Temperature range	17.38	15.9	14.06	14.62
Lbs. jacket water per hour	7260	7242	7248	7272
Heat loss to water per hour	126200	115100	101900	106500
Heat loss, per cent	40.7	40.1	21.5	26.81
Volumetric Eff. from card	53.42	....	....	....
I. H. P.	21.40	....	....	....
Pumping losses	6.40	....	....	....
Mechanical Eff.	70%			
Maximum explosion pressure	155.97 pounds per sq. inch.			

TABLE NUMBER 3

20 H. P. at 1000 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	30	30	30	30
Net brake scale reading	33	33	33	33
Gasoline consumed, cu. in	343	342	555.5	468
Setting of needle valve, ° open	350	360	450	540
Sp. gr. of gasoline	.700	.705	.700	.700
B. T. U. supplied per hour	323000	325000	525000	441000
Average D. H. P	20.02	19.83	20	19.99
Thermal equivalent of H. P	51000	50500	50900	50890
Thermal Eff. (D. H. P.), per cent	15.79	15.52	9.7	11.51
Total number of revolutions	30035	29700	30000	29975
Revolutions per minute	1001.2	990	1000	999.2
Lbs. of gasoline per 1000 revolutions	.2885	.293	.468	.395
Temperature of jacket water in	98.73	103.06	92.7	93.33
Temperature of jacket water out	111.06	119.72	108.4	109.7
Temperature range	12.33	16.66	15.7	15.82
Lbs. jacket water per hour	7260	7200	7254	7248
Heat loss to water per hour	89500	120000	111900	114700
Heat loss, per cent	27.75	36.95	21.3	26.0
Volumetric Eff. from card	68.66	....	....	....
I. H. P.	26.6	....	....	....
Pumping losses	6.6	....	....	....
Mechanical Eff.	75.2	....	....	....
Maximum explosion pressure	201.56 pounds per sq. inch.			

TABLE NUMBER 4

25 H. P. at 1000 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	30	30	30	30
Net brake scale reading	41.25	41.25	41.25	41.25
Gasoline consumed, cu. in	369	382	591	521
Setting of needle valve, ° open	350	360	450	540
Sp. grade of gasoline	.700	.702	.700	.700
B. T. U. supplied per hour	348500	361500	552500	491500
Average D. H. P.	25.01	25	25	25.04
Thermal equivalent of H. P.	63600	63595	63595	63700
Thermal Eff. (D. H. P.), per cent	18.28	17.6	11.51	12.96
Total number of revolutions	30015	30000	30000	30050
Revolutions per minute	1003.5	1000	1000	1001.6
Lbs. of gasoline per 1000 revolutions	.31	.323	.498	.438
Temperature of jacket water in	92.88	104.81	92.8	93.62
Temperature of jacket water out	111.7	123.31	109.9	111.12
Temperature range	18.82	18.50	17.1	17.50
Lbs. jacket water per hour	7262	7260	7260	7266
Heat loss to water per hour	146900	152500	135300	145200
Heat loss, per cent	39.3	37.2	22.5	25.89
Volumetric Eff. from card	81.3	....	....	....
I. H. P.	27.75	....	....	....
Pumping losses	2.75	....	....	....
Mechanical Eff.	90	....	....	....
Max. explosion pressure	246.996 pounds per sq. inch.			

TABLE NUMBER 5

30 H. P. at 1000 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	15	15	15	15
Net brake scale reading	49.5	49.5	49.5	49.5
Gasoline consumed, cu. in	209.2	465.5	616	549
Setting of needle valve, ° open	350	360	450	540
Sp. gr. of gasoline	.705	.706	.706	.706
B. T. U. supplied per hour	398000	444000	587500	523500
Average D. H. P.	29.65	30.03	30.01	30
Thermal equivalent of H. P.	75400	76500	76400	76350
Thermal Eff. (D. H. P), per cent	18.95	17.23	13.0	14.6
Total number of revolutions	14800	30050	30010	30000
Revolutions per minute	986.7	1001.6	1000.3	1000
Lbs. of gasoline per 1000 revolutions	.3595	.395	.524	.467
Temperature of jacket water in	103.22	90.3	92.94	93.2
Temperature of jacket water out	123.67	111.25	111.56	113.2
Temperature range	20.45	20.95	18.62	20
Lbs. jacket water per hour	7170	7266	7262	7260
Heat loss to water per hour	146900	152500	135300	145200
Heat loss, per cent	36.9	34.4	23.05	27.8
Volumetric Eff. from card	87.8	....	....	....
I. H. P.	32.4	....	....	....
Pumping losses	2.4	....	....	....
Mechanical Eff.	92.6	....	....	....
Max. explosion pressure	282.41 pounds per sq. inch.			

TABLE NUMBER 6

10 H. P. at 1250 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	30	30	30	30
Net brake scale reading	13.25	13.25	13.25	13.25
Gasoline consumed, cu. in	341	357.9	426.5	395.5
Setting of needle valve, ° open	350	360	450	540
Specific gravity of gasoline	.706	.717	.706	.706
B. T. U. supplied per hour	326000	346600	407500	377000
Average D. H. P.	10.03	10.00	10.04	10
Thermal equivalent of H. P.	25550	25650	25555	25450
Thermal Eff. (D. H. P.), per cent	7.85	7.4	6.27	6.75
Total number of revolutions	37525	37650	37510	37500
Revolutions per minute	1250.8	1255	1250.3	1250
Lbs. of gasoline per 1000 revolutions	.2315	.2455	.290	.2685
Temperature of jacket water in	95	95	97.25	97.56
Temperature of jacket water out	109.7	108.6	108.81	109.56
Temperature range	14.7	13.6	11.56	12
Lbs. of jacket water per hour	8886	8910	8883	8880
Heat loss to water per hour	130800	121200	102800	106560
Heat loss, per cent	40.1	35	25.2	28.3
Volumetric Eff. from card	43.1	....	....	....
I. H. P.	23.1	....	....	....
Pumping losses	13.1	....	....	....
Mechanical Eff.	43.2	....	....	....
Max. explosion pressure	122.63 pounds per sq. inch.			

TABLE NUMBER 7

15 H. P. at 1250 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	30	30	30	30
Net brake scale reading	19.75	19.75	19.75	19.75
Gasoline consumed, cu. in	329	360	553	476
Setting of needle valve, ° open	350	360	450	540
Specific gravity of gasoline	.705	.707	.707	.707
B. T. U. Supplied per hour	313500	343500	528000	455000
Average D. H. P.	15.05	14.94	14.96	14.98
Thermal equivalent of H.P.	38300	38000	38100	38120
Thermal Eff. (D. H. P.), per cent	12.22	11.05	7.21	8.38
Total number of revolutions	37660	37400	37450	37525
Revolutions per minute	1255.3	1246.7	1248.3	1250.8
Lbs. of gasoline per 1000 revolutions	.222	.246	.377	.324
Temperature jacket water in	94.63	94.88	96.75	99.2
Temperature jacket water out	109.5	110.94	110.06	112.5
Temperature range	14.87	16.06	13.31	13.3
Lbs. of jacket water per hour	8916	8868	8874	8886
Heat loss to water per hour	132700	142500	118200	118200
Heat loss, per cent	42.3	41.45	22.4	26
Volumetric Eff. from card	59.45	....	....	....
I. H. P.	24.9	....	....	....
Pumping losses	9.9	....	....	....
Mechanical Eff.	60.2	....	....	....
Max. explosion pressure	140.9 pounds per sq. inch.			

TABLE NUMBER 8

20 H. P. at 1250 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	30	30	30	30
Net brake scale reading	26.4	26.4	26.4	26.4
Gasoline consumed, cu. in	402	417.5	568	532
Setting of needle valve, ° open	350	360	450	540
Specific gravity of gasoline	.706	.705	.706	.706
B. T. U. supplied per hour	384000	396800	541000	508000
Average D. H. P.	19.97	19.96	19.98	20.01
Thermal equivalent of H. P.	50800	50750	50800	50990
Thermal Eff. (D. P. H.), per cent	13.22	12.8	9.4	10.02
Total number of revolutions	37450	37450	37475	37520
Revolutions per minute	1248.3	1248.3	1249.2	1250.67
Lbs. of gasoline per 1000 revolutions	.274	.284	.3865	.361
Temperature jacket water in	94.56	95.47	96.25	96.69
Temperature jacket water out	109.91	110.1	109.68	110.4
Temperature range	15.35	14.63	13.43	13.71
Lbs. of jacket water per hour	8874	8874	8880	8883
Heat loss to water per hour	136300	130100	119500	122000
Heat loss, per cent	35.5	32.8	22.1	24
Volumetric Eff. from card	59.2	....	....	....
I. H. P.	30.55	....	....	....
Pumping losses	10.55	....	....	....
Mechanical Eff.	65.4	....	....	....
Max. explosion pressure	178.48 pounds per sq. inch.			

TABLE NUMBER 9

25 H. P. at 1250 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	30	30	30	30
Net brake scale reading	33	33	33	33
Gasoline consumed, cu. in	445	491.5	536	561
Setting of needle valve, ° open	350	360	450	540
Specific gravity of gasoline	.705	.707	.706	.706
B. T. U. supplied per hour	323000	469000	511000	534000
Average D. H. P.	25	24.98	24.98	25.01
Thermal equivalent of H. P.	63600	63500	63500	63650
Thermal Eff. (D. H. P.), per cent	15	13.55	12.42	11.92
Total number of revolutions	37500	37475	37450	37510
Revolutions per minute	1250	1249.2	1248.3	1250.3
Lbs. of gasoline per 1000 revolutions	.302	.335	.336	.382
Temperature jacket water in	94.6	96.25	96.76	95.25
Temperature jacket water out	109	113.6	112.18	110.375
Temperature range	14.4	17.35	15.42	15.125
Lbs. of jacket water per hour	8880	8880	8874	8898
Heat loss to water per hour	128000	154000	137000	135000
Heat loss, per cent	30.25	32.85	26.8	25.2
Volumetric Eff. from card	64.4	....	....	....
I. H. P.	32.85	....	....	....
Pumping losses	7.85	....	....	....
Mechanical Eff.	76.1	....	....	....
Max. explosion pressure	188.93 pounds per sq. inch.			

TABLE NUMBER 10

30 H. P. at 1250 R. P. M.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	30	30	30	30
Net brake scale reading	39.6	39.6	39.6	39.6
Gasoline consumed, cu. in	501	460	614	585
Setting of needle valve, ° open	350	360	450	540
Specific gravity of gasoline	.705	.706	.706	.706
B. T. U. supplied per hour	476000	437500	585000	556000
Average D. H. P.	30	29.65	30.03	30
Thermal equivalent of H. P.	76250	75500	76400	76350
Thermal Eff. (D. P. H.), per cent	16.01	17.25	13.1	13.75
Total number of revolutions	37500	37200	37525	37500
Revolutions per minute	1250	1240	1250.8	1250
Lbs. of gasoline per 1000 revolutions	.341	.315	.416	.398
Temperature jacket water in	92	94.37	96.75	94.06
Temperature jacket water out	107.5	113.3	112.94	110.06
Temperature range	15.5	18.66	16.19	16
Lbs. of jacket water per hour	8880	8820	8886	8880
Heat loss to water per hour	137800	164800	143900	142200
Heat loss, per cent	28.9	37.6	24.6	25.6
Volumetric Eff. from card	69.6	....	....	....
I. H. P.	34.53	....	....	....
Pumping losses	4.53	....	....	....
Mechanical Eff.	86.8	....	....	....
Max. explosion pressure	217.25 pounds per sq. inch.			

TABLE NUMBER 11

Maximum H. P.

	Run 1	Run 2	Run 3	Run 4
Time of run, minutes	15	20	20	15
Net brake scale reading	56.64	52.61	53.77	51.07
Gasoline consumed, cu. in	154.8	249.2	414.5	258
Setting of needle valve, ° open	360	360	450	450
Specific gravity of gasoline	.705	.705	.701	.705
B. T. U. supplied per hour	294000	356500	575000	490000
Average D. H. P.	20.54	25.08	32.58	38.65
Thermal equivalent of H. P.	52300	65600	82900	98400
Thermal Eff. (D. H. P.), per cent	17.8	18.4	14.41	20.08
Total number of revolutions	8968	16172	20010	20000
Revolutions per minute	579.87	808.6	1000.5	1250
Lbs. of gasoline per 1000 revolutions	.439	.259	.523	.328
Temperature jacket water in	111.89	113.7	88.09	89.5
Temperature jacket water out	138.67	137.5	108.63	108
Temperature range	26.78	23.8	20.54	18.5
Lbs. of jacket water per hour	4608	6000	7260	8880
Heat loss to water per hour	123300	142800	149100	164200
Heat loss, per cent	41.9	40	25.95	33.5
Volumetric Eff. from card	85	87.50	77.03	94.25
I. H. P.	17.85	25.20	29.90	38.25
Maximum explosion pressure	294.66	251.08	236.61	235.88

COMPRESSION-KNOCKING

Editor THE AUTOMOBILE:

[2,023]—I have a four-cylinder 4 by 5 engine that is very noisy and is continually knocking on full throttle. The compression space is very small, less than 1-4 of the stroke. Would you consider it a change for the better to increase the compression space? If so, what proportion is considered best, according to the latest practice?

CONSTANT READER.

South Egremont, Mass.

Resolved into figures in such a form as to show approximately the compression ratio, the above is at once seen to be the cause of the trouble; that is, the compression is so much too high as to cause the knocking spoken of.

The compression figure is arrived at through a consideration of the ratio of the volume of gas drawn into the cylinder to the same gas compressed to a much smaller volume. The first volume is composed of two parts: that swept out by the piston, and that of the compression space. The latter is, also, the second quantity. In other words, the figure desired is:

$$\frac{\text{Vol. swept by piston} + \text{compression space}}{\text{Compression space.}}$$

The volume swept by the piston is the product of the area of the bore by the length of the stroke, in this case, 62.85 cubic inches. The compression space cannot be figured as closely, for the figures given are too indeterminate. Doubtless, the size of the chamber is greater than the cylinder, as to diameter. Usually this amount is 1-8 inch on each side, which would make the diameter 4 1-4 inches. Now the length of this chamber is given as less than one-quarter of the stroke. This would be 1 1-4 inches. Taking a lower figure at random, of say, 1.2 inch, the volume of the compression space becomes 17.03 cubic inches. The ratio of compression is then

$$\frac{62.85 + 17.03}{17.03}$$ which equals 4.68.

Even if it be considered that the shape of the compression chamber is very complicated and 10 per cent be added to it to allow for this, the ratio still remains at the very high figure of 4.35. As the usual figure for this ratio is below 4 and the most usual figure as shown by the latest practice (resulting in a compression of 60 pounds cold) is nearly 3.5, this is seen to be too high.

While not the best way, this can be remedied by shortening the connecting rod, which would not change the piston displacement, but would add a portion of the cylinder bore to the compression space. As this is of a known diameter, the amount which the connecting rod is shortened will determine the ultimate compression. It may be figured thus:

$$\frac{62.85 + x}{x} = \text{the desired ratio, either 4 or 3.5.}$$

Taking the former, this becomes

$$62.85 = 4x - x = 3x,$$

from which x is evaluated as 20.95 cubic inches. Now, as the present volume, which will not be changed, is 17.03, this must be subtracted, leaving 3.92 cubic inches, which must be added to the compression space to make it give a compression ratio of 4. As this will be cylinder bore, divide by the area of that 12.57, and the result, 0.31 inch, will be the amount to shorten the connecting rod. Carrying through the same line of reasoning for the low ratio or 3.5, 0.64 inch is obtained. In view of the result to be obtained, it will be sufficient to shorten it 1-2 inch, which will reduce the compression pressure to about 65 pounds, a very good average figure, and one that will give more satisfactory results than the present ratio.

A FRIEND OF CHAIN DRIVING

Editor THE AUTOMOBILE:

[2,024]—In your August 19 issue, in answer to F. K. Green, of Louisville, Ky., in "Letters Interesting, Answered and Discussed," when speaking of cars with double chain drive, you say: "If one of the chains on a double chain driven car breaks, it is helpless and must be towed home." This is a question that I have explained to several friends. If there are not parts or tools in the kit to repair the chain, the free jackshaft can be bound to the frame or radius rod to keep it from turning. The car can then be brought home on the other chain. In such a case, however, it must be remembered that the differential works all of the time, making the gear ratio in this case half of what it would be otherwise. Nothing higher than second speed should be used as it would strain the gears of the differential. The advantages of a double chain drive are the great strength for the light weight and the lessened loss of power through friction. Thus, in case the chain is bent, any country blacksmith can straighten it. The shaft drive is the most silent drive used to-day, and for that reason many prefer it.

RICHARD S. JOHNSON.

Altadena, Cal.

This subject was covered very thoroughly in the issue of Sept. 2, which you have apparently missed. In a letter from A. Wilson Dods, and the answer to the same, the whole matter was covered. As to the point brought out above, "any country blacksmith can straighten it," this is very true, and equally as true of any part of a shaft-driven car. That is, it would be just as safe to trust the country smith with a bent shaft, if you ever happened to have one bend, which is highly improbable, as it would be to trust the parts of a nickel-steel chain to his tender mercies. If you look into the matter of relative merits of the two forms of drive you will find that silence alone would never have placed the shaft on the high pedestal which it occupies to-day. Other eminent and more valuable qualities, such as lubrication, lessened care, reduced wear, and with these, lowered cost of repairs, have had as much of a bearing on the result as exemplified in the comparative number of the two types to be made for next season, as has the matter of superior quiet, of which you speak so highly.

ENGINE HARD TO START

Editor THE AUTOMOBILE:

[2,025]—I had an experience recently with a two-cylinder opposed, engine under the seat, car three years old which I should like to have explained. At the time this car was overheating badly, so that we had to fill up with water every 20 miles or so. It was also rather low on power, so that several times we stalled the engine. Now, whenever the engine stopped in this way, it positively would not start until it had been cooled by pouring several buckets of water into the radiator with the cylinder cocks open. After being well cooled and getting a five minutes' rest, the engine would start off again quite nicely; otherwise no amount of cranking would get more than an occasional snort.

We have since cured the overheating pretty well, but if you can explain what caused that difficulty in starting, so as to be prepared for some future emergency, I will be much obliged. C. D. P.

New York City.

It would appear as if the overheating was the cause of the hard starting. The cylinders get so hot that the pistons are upon the point of seizing, this being a continuous performance, but nothing happens until you stop, when the boiling water causes the pistons to seize momentarily. Cold water into the circulating system and a long rest, such as you describe, would cool the walls off very materially, causing a drop of perhaps 45 to 50 degrees in the time you mention. This allows the pistons to free themselves, so that the engine may be started. It is just barely possible that some flaw in the fuel supply system causes a copious supply of fuel while the engine is turning over, and, consequently (being opposed), vibrating very much, which is not in evidence when the engine and car are standing still.

To remedy the overheating, put a larger driving and a smaller driven gear on the pump drive so that the pump will be driven faster. This will circulate the water at a higher speed and thus carry away more heat, since the amount of heat carried off by the cooling water varies directly with the amount of water circulated. Thus, if the present gears happen to be each of 6 pitch and 18 teeth, changing the driver to 21 teeth and the driven gear to 15 teeth will leave the center to center distance unchanged at 3 inches, and will increase the pump speed by 40 per cent. If this is not sufficient a later change to a driver of 24 teeth and a driven gear of 12 teeth will also leave the center to center distance unchanged, but will change the speed, increasing it 100 per cent over the first arrangement and 43 per cent over the second method of gearing.

Driving the pump faster will cure your trouble unless the pipes are clogged up. In fact, it would be well to go to the trouble of examining these before making the other change, that is changing the speed of the pump by altering the gearing.

SIX-CYLINDER RADIAL ENGINE

Editor THE AUTOMOBILE:

[2,026]—Will you please advise me about a problem which has troubled me for some time. It is relative to a two-cycle engine of the differential piston type, which I am going to build. In this type of engine, why wouldn't the cylinders take gas from the mixing chambers if the inlet pipe from all chambers was a single pipe forming a circle (the six cylinders being arranged radially, so as to form a circle around the crankcase)? I want a very light weight engine, as I wish to use it in an aeroplane. As near as I can see, the mixture would be the same. I would have to use a suction valve on each chamber and a check valve between each chamber and the working cylinder.

Would aluminum be correct for an exhaust pipe? The enclosed sketch shows the arrangement, and I wish to know if the firing order would be as I have marked it, that is, 1, 2, 3, 4, 5, 6. In other words, will the radial two-cycle, six-cylinder engine fire around the circle of cylinders in regular order? Is the compression chamber as shown of the proper size?

The connecting rods are to have a pin the same size as the wrist pin, connected to a main connecting rod. What I mean by main connecting rod would be the same as any other engine, only the other five rods would have pins to connect them to the main rod bearing. Would the rods be correct if I had a very light forging driven in each end of a light steel tube and brazed? I intend making each end solid bearing, with no take up for wear, with pins 5-8-inch in diameter. Can I get good results with make and break spark, like the Locomobile?

N. F. GILLENWATERS.

Arbuckle, Cal.

In the first matter of the size of cylinders which will be correct to use, it is noted that you wish to use a 3 1-2-inch main cylinder, 5 1-2-inch differential cylinder, and a 3 1-2-inch stroke. Upon first thought it would appear as if the area of the larger or differential cylinder bore should equal that of the smaller or working cylinder, the stroke being equal in each case. This would result in equal volumes. But the volume in the larger cylinder is compressed and then delivered to the working cylinder, this compression being the one and only advantage of this type. Now, if the area of the two cylinders, or more correctly, the volume, is made equal, the one cylinder will compress the charge and deliver it to the other, where it will then be free to expand to its original volume; in fact, taking into account the volume of the connecting pipes or passages, to slightly more than its original volume. So nothing will be gained.

From this we arrive at the conclusion that the ratio of the two volumes must be such that the differential delivers to the working piston a charge of compressed gas, which, *at that pressure*, is of a volume equal to or greater than the volume of that cylinder. It is then necessary to take into account the compression pressure and the resulting volume.

Now, the compression follows closely if not exactly along the adiabatic line, for which the experimentally determined figure of 1.35 is used. That is, the relation between the volume and pressure is expressed by the equation:

$$\left(\frac{V_1}{V_2}\right)^{1.35} = \frac{P_2}{P_1}$$

which may also be put in the more convenient form

$$\frac{V_1}{V_2} = \sqrt[1.35]{\frac{P_2}{P_1}}$$

in which,

V_1 is the original volume,

V_2 is the final volume, or volume of compression,

P_1 is the original pressure, and

P_2 is the final or compression pressure.

To use this formula it will be necessary to assume the compression pressure, so let us select 60 pounds as the quantity. Then, this being gauge pressure, the absolute is 74.7. Atmospheric pressure varies at different elevations, but it will be safe to take it at 14 pounds. This will give a rough but very close average for the atmospheric pressure value. From these two, the ratio of pressure increase is:

$$\frac{P_2}{P_1} = \frac{74.7}{14} = 5.34.$$

From this and the previously given equation, the ratio of volumes is found to be 3.46. Now, as the final volume, V_2, is known, this being the volume of the final cylinder (3 1-2-inch diameter by 3 1-2-inch stroke), simple substitution and division gives for the volume of the differential cylinder 116.498 cubic inches. This will be a circular ring exactly 5 1-2 inches diameter, just as you had decided to use. The construction, as outlined, then, should give a compression of 60 pounds.

Every two-cycle cylinder fires on each one of the down strokes. Six two-cycle cylinders, then, would fire each on its own down stroke, making six per revolution, and requiring that the crank pins be spaced equally around a full circle; that is, one-sixth of 360 degrees apart, which is 60 degrees. Beyond this the order of the firing will be such as the crank is arranged to give. That is, if the pins are properly arranged, it is possible to get a firing order of 1, 2, 3, 4, 5, 6, as you wanted.

In the arrangement of the crankpins you will have the choice of either of two methods: you may have each rod end bear on the pin, as does the Adams-Farwell, shown elsewhere, or you may connect five of the rods to pins located on the sixth rod, as you

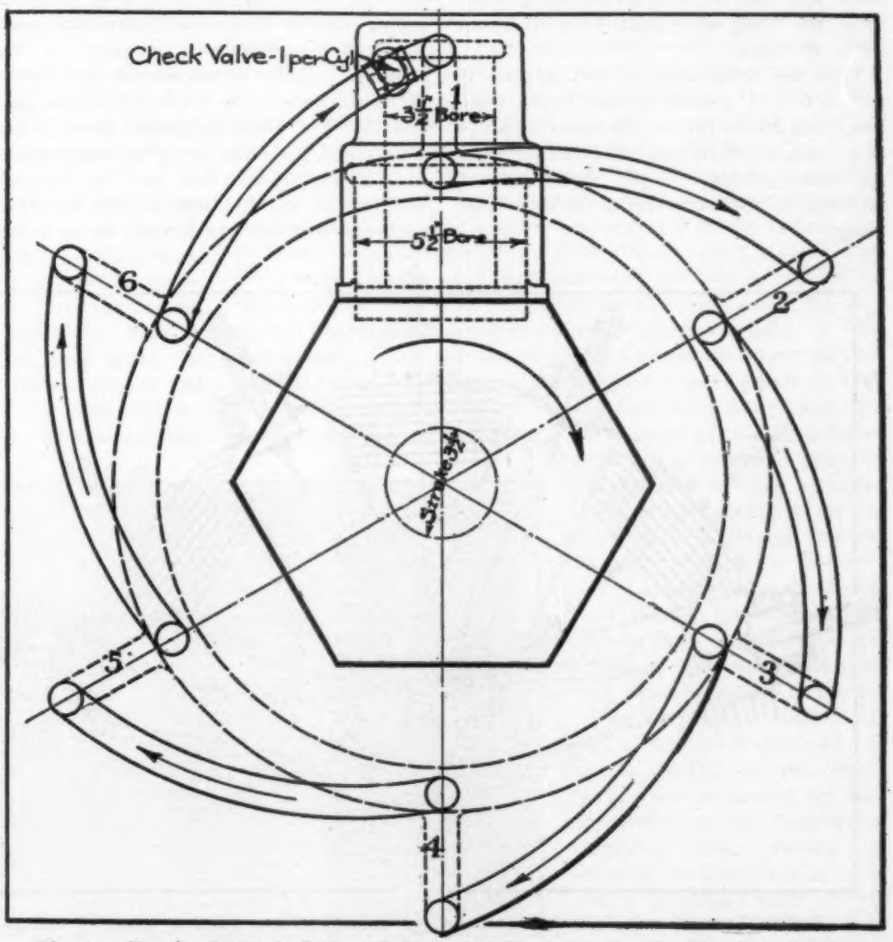
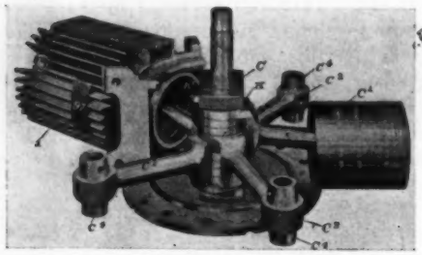
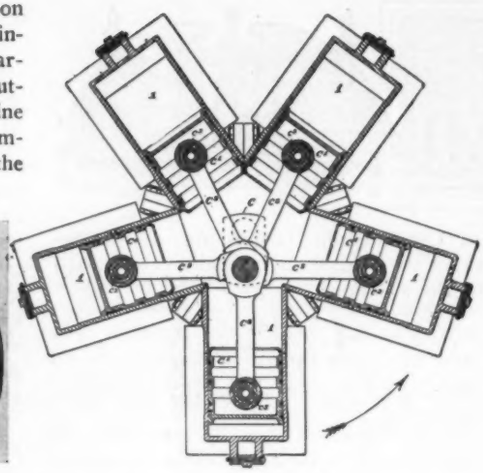


Diagram Showing Writer's Piping (Dotted) and Our Suggestion for This in Solid Lines

suggested that you would do, as is done on the Esnault-Pelterie (French) seven-cylinder aeronautical motor. The Adams-Farwell crankshaft and connecting rod outfit shown belongs to a five-cylinder engine in which the cylinders revolve, but the company also makes a seven-cylinder of the same form and similar construction. In the Esnault-Pelterie you will notice that the cylinders are set in two rows, one back of the other, there being four in the front row and three in the second. This arrangement solves the crankshaft problem; this particular engine having a two-throw shaft, the front set of pistons and rods operating on one pin, and the back set of three operating on the other. In this engine the cylinders are stationary, so that it bears some resemblance to the one which you are building. A glance at the construction will show you that these cylinders being four-cycle, the firing must jump from the front set to the back.





Method of Attaching Connecting Rods on Adams-Farwell Aerial Motor

Thus the firing order is very apparently 1, 5, 2, 6, 3, 7, 4, each cylinder in the front row firing on the part of the down stroke of that crank to which they are attached, while the three cylinders in the back row and attached to the other crank do the same thing.

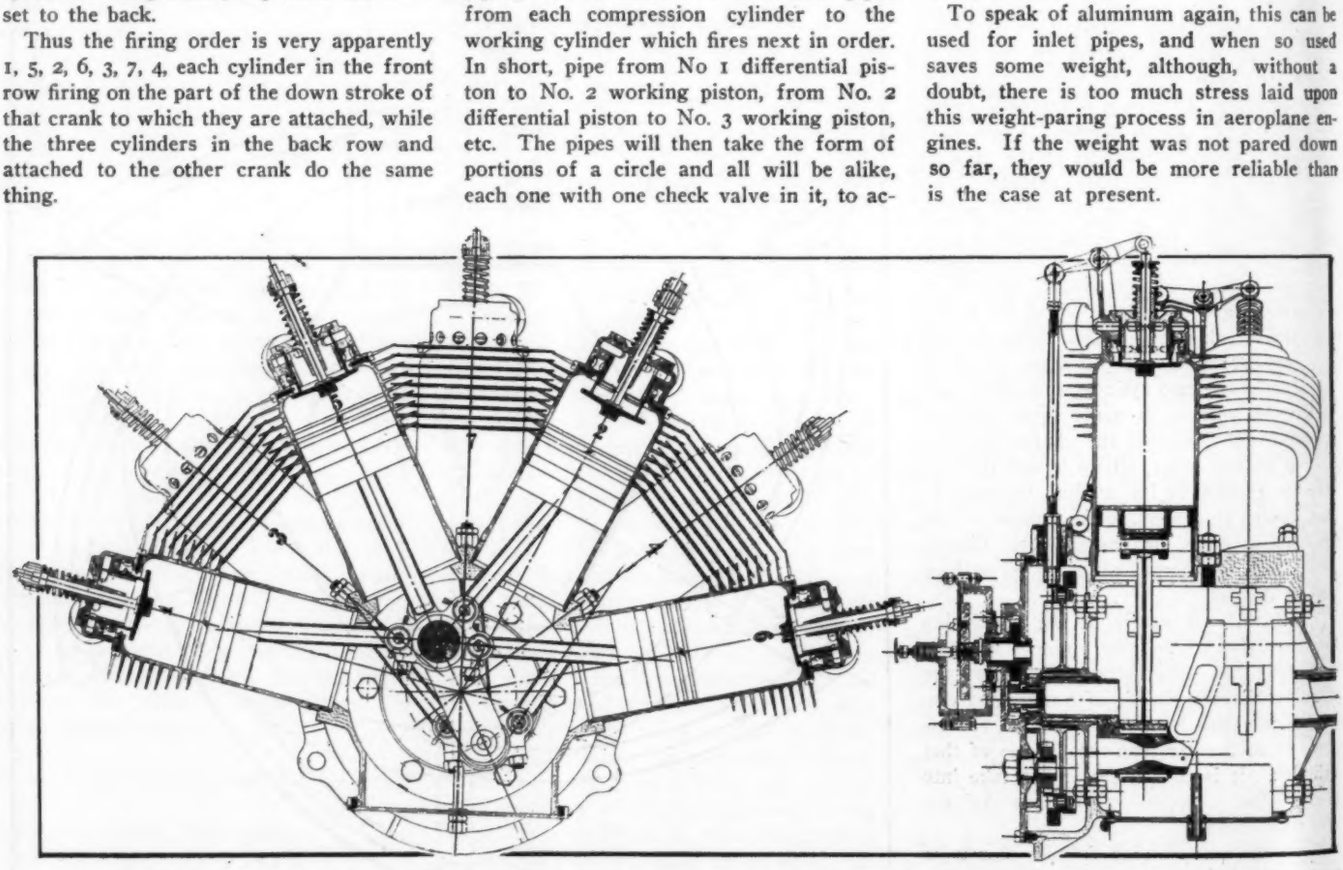
As far as make-and-break ignition is concerned, it is only fair to say that if you follow the Locomobile practice, and do as well as they do with it, your ignition system will give you no trouble. As a matter of fact, we do not know of any aeroplane engines now in use upon which this form has been tried.

The arrangement of the piping to supply mixture to the various cylinders as you have outlined it is not good, neither is it correct. If you arrange your crank so as to fire the cylinders around the circle in natural order, that is, 1, 2, 3, 4, 5, 6, the piping should consist of individual pipes from each compression cylinder to the working cylinder which fires next in order. In short, pipe from No 1 differential piston to No. 2 working piston, from No. 2 differential piston to No. 3 working piston, etc. The pipes will then take the form of portions of a circle and all will be alike, each one with one check valve in it, to account for and take care of the fact that this method furnishes gas to an ascending piston, which may drive part of the charge back, if a check valve is not used.

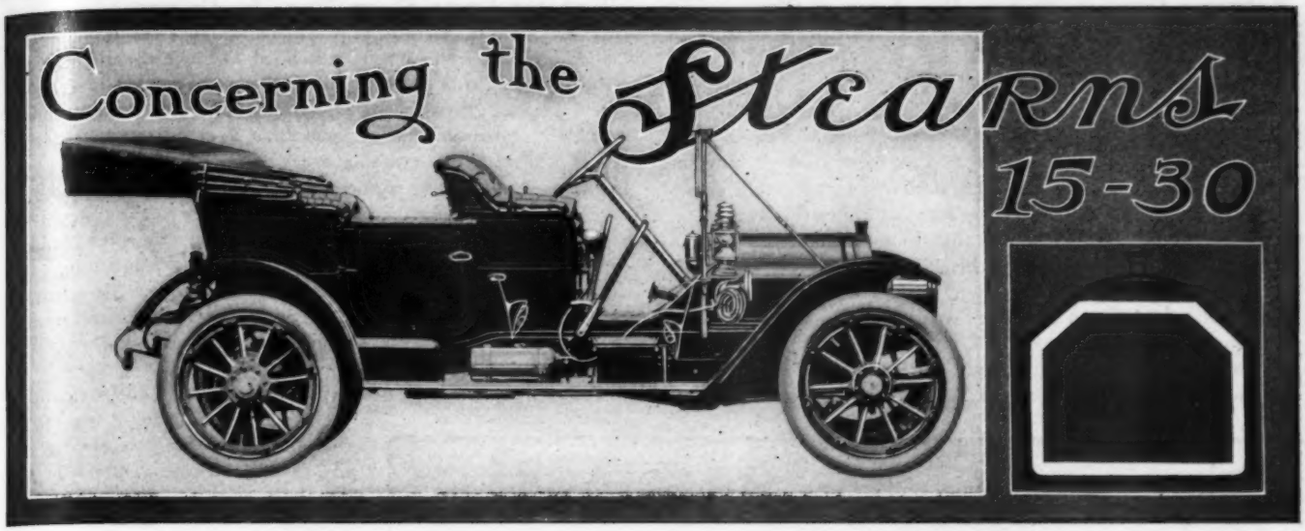
It is not advisable to use aluminum for exhaust pipes, or elsewhere, if it is liable to be subjected to great heat. Steel tubes may be used for connecting rods, with machined drop forgings set into the ends, pinned and brazed. This requires very careful workmanship, for if the pins be omitted the only strength the rods will have in tension will be the brazed joint. As brazing is usually a doubtful operation, this must be watched closely and carefully.

The use of a solid end bearing is, however, to be deplored since it gains nothing and is a distinct disadvantage. That is, you would not save any weight, which, we take it, is the idea. The reason why you won't save any weight is this: to get the rod on and off of the crank pin, it will be necessary to have it split and have bolts to hold the two halves together. Placing a few shims in between the halves, which shims would not weigh any more than a corresponding thickness of either rod or bearing metal, would thus add nothing. On the other hand, if you should ever try to sell these engines, the fact that the bearings were not adjustable for the inevitable wear would militate against them very much. All this is said with the mental reservation, unless you use ball bearings. From your letter, which is fairly explicit, we believe that this was not the intention.

To speak of aluminum again, this can be used for inlet pipes, and when so used saves some weight, although, without a doubt, there is too much stress laid upon this weight-paring process in aeroplane engines. If the weight was not pared down so far, they would be more reliable than is the case at present.



Section Through and End View of Esnault-Pelterie Aeroplane Motor, Showing Another Method of Attaching Connecting Rods

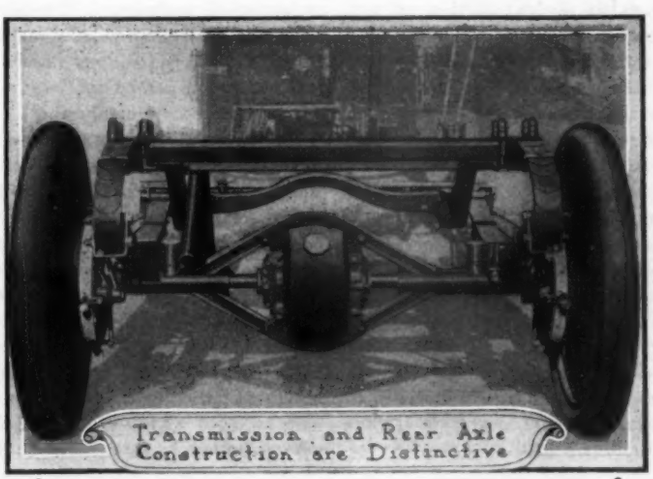


DISTINGUISHED as they are by the "white line around the radiator," as well as other very evident marks, the cars made by the F. B. Stearns Company, Cleveland, Ohio, are worthy of notice wherever they may be. This striking mark only serves to allow of ready recognition, for the sterling merit of the product of the Ohio factory would bring it attention anywhere. Coincident with the details of the models for the ensuing year, this company announces one very praiseworthy change. This is not in the nature of a mechanical alteration, but a policy. It is the abandonment of the method of speaking of the cars as yearly models. This practice, which has outlived its usefulness, for the changes now are so slight from year to year as not to change the car as a whole, at least not sufficient to warrant calling it a different model, will doubtless be followed by a number of other concerns now that a start has been made.

In the future the Stearns cars will be put through the shop the same as in the past, in groups or series of a given number. So, to give the cars a distinguishing mark, where that becomes necessary, they will be called "New Series." The present subject matter deals with the "New Series" 15-30.

This small car will have very few changes, among which may be noticed the reinforced three-quarter elliptic rear spring suspension, multiple disc clutch, and an alteration in the frame to go with the change in the springing, and bring out its best qualities. This car, which made its début last year, faces the present selling season with a most excellent record behind it. Built in toy tonneau, touring, limousine, and landaulet body types, the small member of the Stearns line met with instant success and at once established itself as fully worthy of the name and the "white line." The distinctive features at once become popular.

In general design this car follows the same structural and mechanical features of the other higher-powered models, and the same high-class material is used. While no mention is made of the fact that some of the materials are brought from abroad, it is no secret that the whole of this country and Europe is scoured to secure the best in this line. That success attends these efforts is told best by the record of the car in steady service, in road races, hill climbs, and track races, under all of which conditions it has acquitted itself with much credit.


Transmission and Rear Axle Construction are Distinctive

Motor Details Are of Unusual Interest—The motor is of 4 1-2 inch bore by 4 5-8 inch stroke, and differs from the larger Stearns engines only in the relative size of parts and the casting of the cylinders in a unit, or *en bloc*, as it is called. In this, it is one of the largest sized engines to employ this form of simplified construction, which is now being used to the exclusion of everything else in continental Europe. By means of this construction many combinations of parts are possible, which in turn allow of the elimination of still other parts. This latter feature simplifies the water, carbureter and exhaust piping and gives greater compactness, fewer pieces and more accessibility to parts. It has ball-bearing mounted crank and camshafts. All valves are of the same size and on one side; centrifugal water pump and other mechanical details of exactly the same type as on former motors.

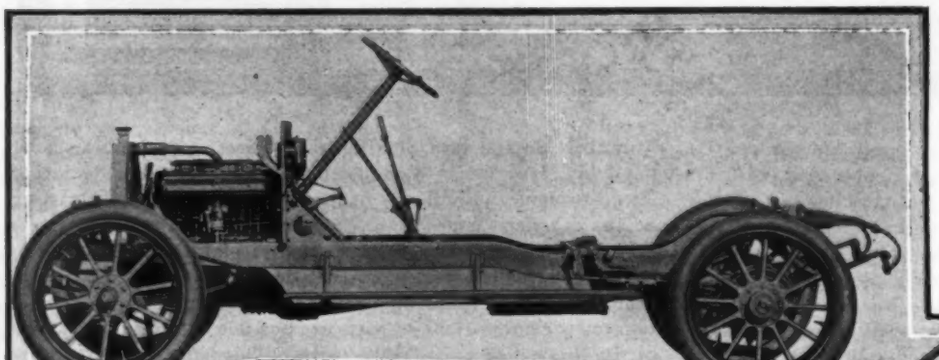
Lubrication is by the constant circulation system now in general use. The reservoir on the bottom of the crankcase supplies oil to a gear-driven pump. The pump discharges the oil on the connecting rods and is drained through screens back into the reservoir. The system is simple, but highly effective.

The carbureter is the same type which has been so successful on the 30-60 model. It consists of practically two carbureters, fed from the same float chamber and actuated by the same throttle lever. The mixing chamber is divided in such a manner that for a small opening of throttle, the small jet only is exposed to the suction of the motor and all of the gasoline used to develop up to 15 horsepower is supplied through this one nozzle. A further opening of the throttle brings into action the larger part of the carbureter with its gasoline jet, and a greater supply of fuel is available, sufficient, in fact, to produce more power than the maximum rating of the motor. Correctness of mixing proportions and economy of gasoline are assured by this arrangement. It accounts in part for the noted smooth running flexibility and power of the motor.

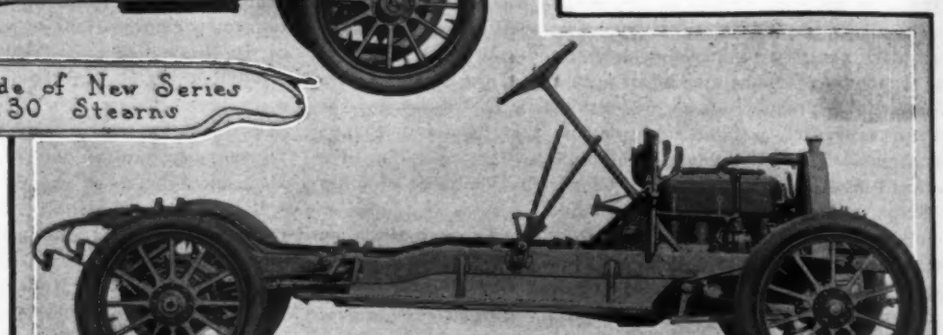
The ignition is by the Bosch dual system, consisting of an arrangement of high-tension magneto and single vibrator coil, whereby with a single set of spark plugs a double system of ignition is obtained. A simple switch on the dashboard permits running the motor either on the battery or magneto. Being directly in front of the driver it is an easy matter to change from one to the other.

Preference Given to Multiple Disc Form of Clutch—The clutch is of the well-known multiple disc type. Its characteristics—smoothness of operation, reliability and simplicity—which have made for the adoption of this type of clutch by the best automobile builders, are assured in this car by correct design and workmanship. The adoption of this form of clutch may possibly foreshadow the more extended use of this form in the future on other cars, coupled, as it is, with similar reports from other equally high-grade factories. One fact stands out very prominently in the clutch problem, and that is the fact that whatever else may be said for or against this kind of a clutch, all admit that there is nothing to burn out or be injured. This makes it a very good clutch for a beginner to learn on.

A propeller shaft and one universal joint transmit the power from the clutch to the transmission, which is located on the rear axle, and of the special compact type originally used.



Left Side of New Series 15-30 Stearns



Right Side of 15-30 Chassis Showing Control Mechanism

The transmission is of the selective type and gives three speeds forward and reverse. The gears are of chrome-nickel steel properly heat-treated and of liberal dimensions. The shafts are also of this steel, all mounted on ball bearings.

The rear axle is of original design and worthy of special note. It is machined from a one-piece drop forging of nickel steel. It has an open truss-like center portion of I-beam section which spans the transmission case top and bottom, while at the same time it serves as a support for the latter. The ends of the forging are turned to mount the wheel bearings. It is bored through the center to take the drive shafts which extend from the differential gears in the transmission through the axle to jaw clutches on the outer end of the rear hub. This gives an axle which is without a joint and supports the weight of the car entirely independent of the transmission. The transmission is relieved of all strain other than that of transmitting the power of the engine to the rear wheel. The whole construction is good in that it gives absolute protection for the driving mechanism from all road shocks and strains but takes such strains on a hollow axle which for strength and reliability is only equalled by the more common solid.

A torsion tube extends from the forward end of the transmission case to a pivoted yoke. This encloses the propeller shaft and its universal joint, and serves both as a torsion and radius rod.

This form of transmission arrangement, coming, as it does, midway between the more usual mid-location and the solidly mounted transmission on the rear axle, possesses some of the advantages of both, without corresponding drawbacks. Thus, the mounting is such that road shocks do not transmit directly to the transmission case, shafts, bearings, and gears, with the consequent destructive effect upon them.

What the Frame Shows That Is Different—Coincident with the change in the rear springing the frame has been changed, the differences being intended to make the already easy riding car ride still easier. The frame is narrowed in front to permit a sharp turning angle; while maintaining the standard tread of the wheels this car will turn in a circle of 34 feet, a decided advantage in handling a car in narrow streets.

A double drop in the frame permits the mounting of a body of very graceful design with extremely low doors. The step from running board into the body is consequently very slight, and in service, where one gets in and out of the car frequently, as in shopping, this feature is particularly pleasing. A drop in the frame also lowers the center of gravity of the car, increasing its stability and one notices a greater sense of security when riding at high speed.

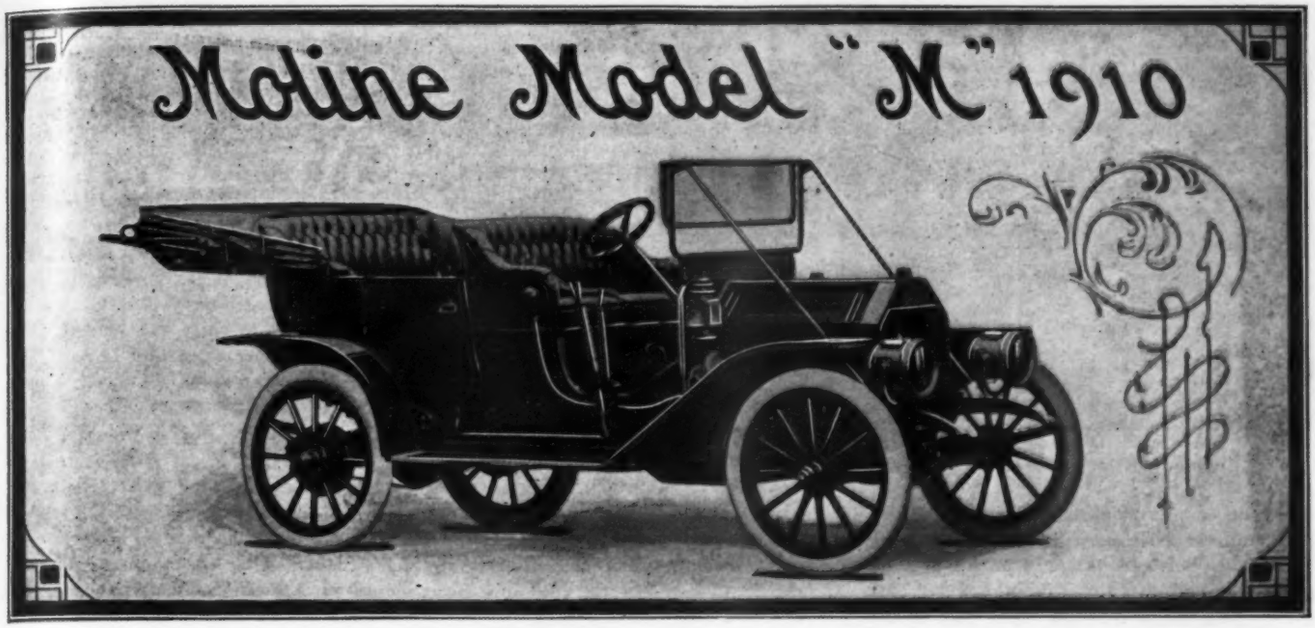
The spring suspension is of the semi-elliptic type in front, and of the three-quarter elliptic type in the rear. It is extremely successful and makes the car ride very easily and smoothly over rough roads.

With increased stability due to lowered center of gravity, lowered step, and easier riding, the change is seen to be worth while, involving, as it does, three good and very essential features.

The brakes act directly on the rear hub flanges. The service or foot brake is a contracting band on the outside of the drum and is operated by a foot pedal in the usual way. The emergency brake is an internal expanding shoe, and is operated by a hand lever. Both brakes are fabric lined and easily adjusted.

The wheels, front and rear, are mounted on adjustable roller bearings. Continental detachable rims are now regularly supplied as standard equipment. These wheels are of 34-inch diameter, with 4-inch tires all around, thus making all wheels interchangeable. In case of trouble, the fronts may be changed to the rear and the rears placed in front. This is a very good point, and one well worth remembering.

Unchanged is the tread, which is standard at 56 1-2 inches, as is also the wheelbase, which remains at 116 inches. As previously stated, four body forms are built, of which the purchaser has a choice. These are the enclosed bodies, both limousine and landaulet; toy tonneau, which accommodates four; and regular touring car. The chassis price is $2,900, all bodies being extra, and the price of the same varies from $300 for a touring or toy tonneau upward to $900 for the spacious and well-appointed landaulet. While this seems a large price to pay for a small town car, the value lies concealed within the material and workmanship, which together go to make up a car that will last. It is said with truth of a high-grade car, that nine-tenths of it is concealed where the purchaser cannot see it. Repair bills show it, however.



TO enter the "$1,500 class" with a poor car would be folly for any manufacturer, but to enter the same with an unusually high-grade car, which has already scored a signal success in the Glidden tour, is to take front rank at once. Such is the case of the Moline Automobile Company, with Model M, which besides representing the utmost in value, will be featured as the leader of the Moline 1910 line. This will be made in several styles of body, on the one chassis, the bodies comprising the regular five passenger touring car, four passenger toy tonneau, a single rumble seat roadster, and finally a new type, in the beetleblack roadster. The touring car still seems to be the principal type and that is an unusually graceful body with pleasing lines, roomy spaces making for ease and comfort, the whole making up into an admirable looking car. A long wheelbase, adequate springing, and large sized wheels give easy riding qualities without which all other qualities are worthless.

Experience Back of the Power Plant—A bang-up, first-class power plant is insured by the years back of the construction. Although comparatively late comers into the automobile business, this company, in its big plant at E. Moline, Ill., has been building gas engines, both stationary and for traction engines, for a period of a dozen years prior to the entry into the automobile field. Not only were these engines good, but they were very high grade, selling for the highest price in their class, which alone speaks volumes for their construction. Bringing all this experience and the factory which goes with it, to bear upon the construction of a couple of models of automobiles, it will be strange if the latter are not far above the ordinary. Their past performances, of which the Glidden tour was but a single instance, shows that this has come true.

The motor is of 4-inch diameter and a slightly longer stroke, 4 1-2 inches. The arrangement is of the timetried Renault motor, valves all on one side. These latter are made with a 35 per cent nickel steel head, this material being used to avoid the pitting action of the heated gases, experience having proven that this was the only metal which successfully resists that action. The valves and push rods are both adjustable for wear, the adjustments being very accessible. In fact, the company makes a great point of the accessibility of all adjustments, holding the very sensible position that an adjustment which is inaccessible is about as good as no adjustment at all.

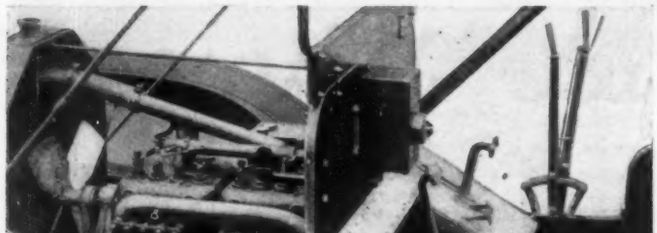
Engine bearings are a nickel alloy metal, made for this purpose. These bearings are long and of large diameter. The crankshaft is a drop forging of selected metal, properly heat treated to bring out the highest strength in the material. Lubrication of the crankshaft bearings and the interior of the case is by force feed, with an oiler located on the engine, from which a sight feed tester is conveniently placed on the dashboard. This brings it right before the driver, so that he can control all lubrication wtihout leaving the seat of the car. For this system, the Moline people claim that it is economical and cleanly, which can not be said of the indiscriminate splash system.

Ignition is cared for in a manner out of the ordinary, for not only is there a magneto system for regular running, and an alternate battery system for starting and emergency uses, but provision is also made for the fitting of a third system, should it become either desirable or necessary. The battery starting arrangement is made complete and up-to-date by the use of a push button placed on the steering wheel. In this way, the motor may be started from the seat. The makers do not specify what magneto is used but say that the best American-made magneto will be used.

Leather-Faced Cone Clutch Is Readily Accessible—The design of the clutch is such that it can be removed from the car, without disturbing anything else, or interfering with the alignment of the motor or transmission, by simply raising the floor boards. It is of the cone type, leather faced with cork inserts, and has ball bearings to take up all thrust. The working parts are completely housed and are packed in grease, which reduces wear to a minimum.

Back of the clutch, that is, in a mid-position, is the transmission. This is of the vertical type that is, the jack shaft is placed below the main shaft, the two being in line in a vertical plane. It affords three speeds and a reverse, operating on the selective plan. On high speed, the drive is direct, no double reduction being interposed to eat up power. Frictional losses are reduced to a minimum by the use of Timken roller bearings, which are used freely, every shaft being mounted upon them. The gears are made from the highest grade of nickel alloy steel, which is hardened and ground after machining to size. The gears are very accurately cut, a close inspection preventing any but perfect ones passing through and thus, entering into the makeup of the car. The aluminum gear box is provided with a large top plate, which is readily removable. This makes it an easy matter to get at any of the gears or shafts for inspection or repairs. The placing longitudinally of the car is also very good, being directly under the footboard where the driver may lift a board, open up for inspection, and go on his way, without leaving the seat.

Both axles show careful designing, the rear being of high carbon steel, which is connected to the power plant at the front by means of the propeller shaft, which contains within its length but one universal joint. The driving shaft is housed in large



Engine and Control Mechanism from the Left Side

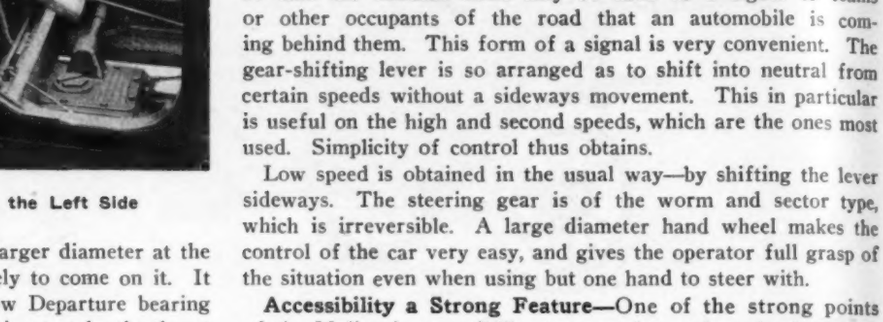
diameter tubing, which tapers up to a still larger diameter at the rear end where the greatest strains are likely to come on it. It turns on roller bearings, with a double New Departure bearing at the rear end, just ahead of the beveled pinion to take the thrust there. In addition a torque rod is used to take the reaction of the driving effort back to the frame at a point where it possesses great stiffness. The front axle is of the I-section now in general use, practice having proved this to be the best section for all around strength and stiffness. It is carefully heat treated from a drop forging. The steering knuckles are carried on heavy knuckle bolts, which turn in bronze bushings.

The pressed steel frame is suspended on semi-elliptic flat front springs of rather short length, stiffer springs here giving the best results. In the rear, however, scroll-ended full elliptics, 42 inches long, are used. These are suspended from above the frame so as to keep the center of gravity low. The frame at the rear is slightly upswept, while the rear cross-stiffener is arched over the differential housing, to insure clearance at all times, even with the springs compressed. The frame itself is of channel section, with the open side turned in. All cross members are of the same section, and are united to the main frame by hot-riveting, which makes them a permanent part.

All brakes are placed on the rear wheels, these consisting of one pair of external band brakes, 12-inch diameter, which are controlled by the driver through a foot pedal. The other brakes are internal expanding, and operate by means of a hand lever. The latter is interconnected with the clutch, so that its application also throws this out, and thus cuts off the application of power to the road wheels. The control is located on top of the steering post, and consists of a pair of finger levers, one for the spark and the other for the throttle. For governing the speed of the car a foot throttle is also provided. This is located on the footboard, to the left of the larger control pedals, in a position to be readily accessible to the left foot. Beyond that, in turn, is located the muffler cutout, this small foot pedal opening the muffler, so that the exhaust noise may be used as a signal to teams or other occupants of the road that an automobile is coming behind them. This form of a signal is very convenient. The gear-shifting lever is so arranged as to shift into neutral from certain speeds without a sideways movement. This in particular is useful on the high and second speeds, which are the ones most used. Simplicity of control thus obtains.

Low speed is obtained in the usual way—by shifting the lever sideways. The steering gear is of the worm and sector type, which is irreversible. A large diameter hand wheel makes the control of the car very easy, and gives the operator full grasp of the situation even when using but one hand to steer with.

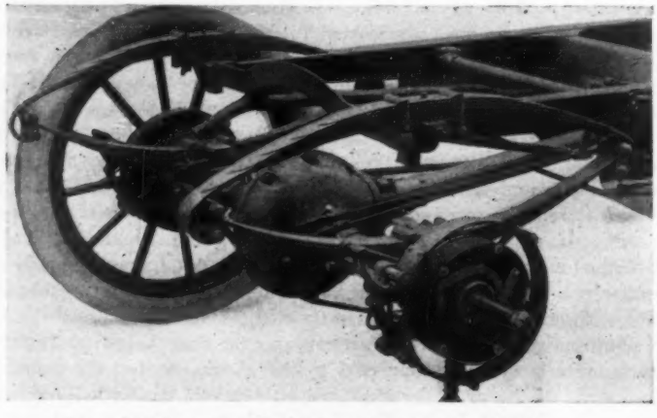
Accessibility a Strong Feature—One of the strong points of the Moline is accessibility to operating and mechanical parts. Everything that needs attention can be readily reached and is in plain view by simply removing floor boards and hood which uncover the entire power plant, back to the universal joint, giving ample room for operator to work and make any needed adjustment or repairs for ordinary running. Adjustment of valves is very easy, as exhaust manifold does not interfere. The same is true of the magneto and carbureter. Clutch is also readily accessible. Brake adjustments are made outside of brake drums. The control of the Moline, the care, the ease of operation, and the simplicity of the entire mechanism have made it a favorite with the man who prefers to operate and care for his own machine.



Moline Model M Chassis, Showing to Advantage the Pressed Steel Frame

Cooling is effected by the natural circulation of the water, or thermo-syphon system, as it is called. The radiator is very large, giving a liberal cooling surface, which produces the lowest temperature advisable to use with a gasoline engine.

At the selling price of $1,500 the equipment includes a magneto, two gas lamps and generator for the same, two side lamps, rear or tail lamp, horn, tool box, and a complete set of tools. The latter is unusually complete since this car is intended primarily for the man who takes care of his own machine and patronizes the public garage and repair shop only when absolutely necessary. It was with the idea of proving the adaptability of the car to this class of people that the entries were made in the Glidden tour. It will be remembered by those who followed the course of the tour that these cars carried no repair parts whatever, being the only ones to undertake the long grind without extra equipment. Their success was, therefore, all the more commendable for this reason.



Rear Construction Displaying the Scroll Ended Springs

MINERAL GREASES VS. ANIMAL GREASES

Editor THE AUTOMOBILE:

In your valued journal of the issue of August 19 there is published an article entitled "Grease or Oil in Transmission Gears," by H. L. Towle, that contains certain conclusions to which we take serious exception. We refer especially to the last paragraph of Mr. Towle's article, in which it is stated that

"Grease compounded of animal fats have not been considered at all, since while they have their uses, they are distinctly unsuitable for gear lubrication, because of the fact that they remain hard until softened by heat—which heat must generally be engendered by the friction of the rubbing parts themselves. In addition, animal greases are not permanent. They turn rancid in time and form acids very deleterious to bearing surfaces. Where ball or roller bearings are used, grease containing any percentage of animal fats should be absolutely excluded."

Since Mr. Towle has given to mineral greases all of the virtues which properly belong to animal greases, and has, by the same token, condemned animal greases by attributing to them all of the numerous disadvantages possessed by mineral greases for lubricating purposes, it seems opportune to request the use of your editorial columns for the purpose of giving to your readers some definite facts covering the elements which enter into the two products. A brief symposium of the constituents of mineral and animal greases will therefore be given:

Mineral Greases—Under the name may be included various consistent products which are manufactured from mineral oil, horse fat, rosin, and slaked lime, and may also contain solid lubricants such as graphite, talc, etc., or mere filling materials such as barytes and chalk. These greases are poor lubricants.

Animal Greases—Under this name are included all tallow compounds, the yellow lubricating grease so extensively used for bearings of all machinery and transmissions. The main component in this compound being tallow having the highest titre and made from selected kidney beef fats, which, when perfectly compounded and thoroughly boiled to a uniform consistency, have a quality which is superior to the best mineral compounds.

A transmission will contain within itself both quick and slow speeds and heavy and light pressures; now, it will follow, that to efficiently lubricate these gears a lubricant is required that is free from impurities, always uniform in quality, and suited to all conditions, having a comparatively low melting point, so that it will readily melt between the teeth of the gears. Thus the bearing surface will be in the state of an oil-lubricated bearing. Since the friction cannot be reduced till the temperature of the bearing or bearing surfaces of the teeth has risen enough for the grease to melt, or at least to be softened so it can flow over them, it follows that other things being equal, the grease with the highest melting paint (mineral greases) will produce the highest coefficient of friction. Hence the lowest melting grease that will stay in the bearing surface will have the lowest coefficient of friction, which is only another way of saying that a grease melting—i.e., an emulsion—will give the best results wherever it can possibly be used.

It has been noted in all tests that the lime soap greases (mineral greases), the most common type to-day, do not give as good results as the oldest, though more expensive type of tallow greases. These facts have been many times demonstrated in efficiency tests, therefore mineral greases are looked upon as a very undesirable class and if kept for any length of time they oxidize and become rancid, indicated by their rapid discoloration when exposed to the air, having a great affinity for oxygen, which they readily absorb, though cheap of themselves and in reality most expensive, being inefficient and destructive.

On the other hand, a good boiled tallow grease is perfectly neutral, and will remain so for an indefinite length of time. In consistency it can be made anywhere from a soft plastic state (through which the gears do not cut a path, as the mechanical action or agitation produces an emulsion that continually feeds and clings to the surface of the gears, lubricating the points of contact thoroughly) to one of a very tough and hard body (where pressure from a compression cup acts as the feeding force) and thereby adapt themselves to any condition whether used in a transmission case or on the most critical bearing of a motor or machine.

A perfect lubricant exemplified by a high grade tallow grease will virtually eliminate the drip and waste and muss of fluid oil and the clogging, dragging effect of mineral greases, consequently absorbs less power in the transmissions, at the same time protecting the gears by cushioning the shocks of changing speed, being a lubricant which will distribute readily and not leak from the casings.

New York City. ADAM COOK'S SONS.

MARMONS MAY OR MAY NOT RACE

Editor THE AUTOMOBILE:

It has been reported in trade papers that we will never again participate in track or road races. We have never made a statement of this kind. We are not saying that we will take part in race events, and we are not saying that we will not take part.

Indianapolis. NORDYKE & MARMON COMPANY.

DETAILS OF THE SANTA MONICA RACE

Editor THE AUTOMOBILE:

Perhaps your readers would like some further information regarding the Santa Monica road race. This is the fastest stock-car race ever run in America, the winner averaging 64.45 miles an hour. One race was faster—the Savannah—by a fraction of a mile. It was faster than any Vanderbilt and far superior to the Cobe trophy, with its miserable 49.26 miles an hour.

The course is 8.4 miles in length and the total distance covered 202.4 miles. It is situated between Santa Monica and Los Angeles, running along the ocean front and through the town of Santa Monica. The drivers agreed to a man that it was the best managed as well as the speediest course in the United States.

The winning average of the Chalmers-Detroit, driven by Bert Dingley, in the light car race was 55.5 miles an hour. This is the fastest of the small car races. Dingley was given a close run for the money by Siefert, another excellent driver who piloted his Stoddard to a good second. The Buick driven by Nikrent took third.

The "Big Race" started at 8 a. m. before a crowd of 40,000 people. The Apperson won in splendid time after a well-driven race. The Chadwick with Seibel as driver took second, Stearns third and Locomobile fourth. The winning cars did not have to replace a single tire, and only two or three spares were used during the whole day. This is a plain testimonial of the quality of the course.

The fact that only a slight mention of this race was made in your magazine, although pages were given to describing the much inferior Cobe and Indiana races, moved me to give you a little more specifically the details. INVISABLE GREEN, JR.

Pasadena, Cal.

The Santa Monica race was undoubtedly fast and interesting, and our notice perhaps inadequate, but in judging its value relative to the Eastern races there are several points our correspondent has failed to take into consideration. Principal of these is the distance. The Santa Monica race called for 202.4 miles; but the last Vanderbilt was 258.1 miles, the Cobe trophy 395.6 miles, and the Savannah race 402.1 miles. No car or driver can be expected to make as good time in a 400-mile race as in one of 200 miles. But, for that matter, speed is not the only desirable quality in road racing. One of the purposes of this form of contest just as important as finding a car's greatest speed is to test its endurance. Entirely aside from quality of the racing, the Santa Monica race was little more than a local affair, whereas the other races were national in their scope.

BOSTON'S HARD-USED AUTOMOBILES

BOSTON, Sept. 20—Mayor Hibbard recently sent to the board of aldermen a communication concerning the city's automobile equipment. The city has 26 machines, 17 of which have been purchased since Mayor Hibbard took office January 1, 1908. During his administration the city has expended approximately $108,000 on automobiles. For new machines the city has paid $65,533.13, for maintenance and repairs $29,962.51, and for wages of chauffeurs $12,502.89. The police and fire department have six machines apiece, the street department three, the water and bath department two each. The building, engineering, hospital, park, public grounds and schoolhouse departments have machines, and the mayor's office has a car.

Automobiles in the service of the city apparently receive hard usage, or else the city is not sharp at trading, for machines that have been sold have brought poor prices. Three runabouts for the police department that cost $2,038 sold for only $50, a car costing $1,003.50 brought $126, another that cost $1,350 sold for $176.40, and a runabout costing $708.15 sold for $175. The mayor's car has cost $7,877.46, of which $3,360 is for the car, $3,276.76 for maintenance, and $1,240.70 for the chauffeur.

OHIO TOWNS TO HOLD ANNUAL HILL-CLIMB

UHRICHSVILLE, O., Sept. 20—The Twin City Automobile Club, of this city and Dennison, O., has decided to hold its second annual hill-climbing contest Friday, October 1. The cars are to be divided in five classes, for roadsters under and over 24 horsepower, for touring cars under and over the same limit, and for single-cylinder cars. The winner in each class will receive a silver cup. A parade of decorated cars will be held in the forenoon, for which additional prizes are offered.

THE AUTOMOBILE

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THE PROBLEM OF THE ROADS

The problem of the roads really concerns everybody, including the man who may think himself exempt for the reason that he does not drive or ride in a vehicle which travels over the highway. But even he cannot escape the effects of bad roads, with the attending greater expense to the farmer, who supplies him with the necessities of life, and who consequently must exact a greater toll for the delivery of his farm products.

Another thing which is as certain as the rising of the sun on the morrow, is that all road users will employ motor-driven vehicles in the not distant future—a future which has been greatly lessened in prospect in the last year or two, with the arrival of the moderate-priced car and its assured sturdiness and reliability.

While it would appear that the National Good Roads Convention in Cleveland this week has an automobile aspect, and the participation of the National Grange is only illustrative of the growing friendliness between the man who contributes substantially to the building of the highways and the man who uses them most assiduously, the man of the country is in reality actuated by personal interest rather than by a desire to serve in the capacity of a partial philanthropist.

This is a great country, of vast distances, and the building of its roads is a work that will have to continue for many years; but judging from the present widespread interest from coast to coast, it will soon be possible for tourists to ride in comfort through any commonwealth which pretends to keep abreast of the times.

When that time comes and our own roads are the equal if not the superior of the famous roads abroad, it will be possible for the man of moderate means to see the country as he never saw it before. If from no other point of view than a selfish interest in future possibilities, this movement should thus have universal support.

ECONOMIC VALUE OF ROADS

Every inhabitant of this country is vitally concerned in its roads. Whether a man uses the roads himself, in a carriage or automobile, has little bearing on the matter; if he does, their faults are brought home to him by his bodily discomfort. If he does not use them, he may stay at home comfortably in an easy chair, but he pays tribute to them equally with the user.

Transportation is civilization; and transportation by road is no less important than transportation by rail or by water. Every article of food or clothing, every daily necessity or luxury, must be carried to the person who is to use it, and the user must pay the expense of carriage. The price of each loaf of bread includes the cost of hauling the wheat to the railroad; and if the hauling is done over bad roads it will cost more than if it is done over good roads. The farmer of the Middle West loads a dozen hogs into his big wagon and drives over to the railroad; if the drive is over rough roads the hogs lose weight, and the New Yorker, sitting down to breakfast a week later, pays more for his pork chops.

The general public has just begun to realize the immense importance of railway transportation in its daily expense accounts. Therefore the Interstate Commerce Commission was delegated to see that this transportation was done as cheaply and efficiently as possible. The Federal Government yearly appropriates millions of dollars for the improvement of waterways, that this form of transportation also may be as cheap and efficient as possible. Yet the roads, which are at least as important as either the rivers or the railways, remain in almost the condition of a hundred years ago.

The cost of road haulage in any one article is almost infinitesimally small, which may lead the casual observer to think that it may be neglected. Railroad rates may be quoted at so many cents a ton, but the cost of a ton-mile in a farmer's "jolt wagon" is not so easy to figure out. Yet those infinitesimal fractions are always present, and it has been estimated that in the course of a year they add up to $250,000,000.

LAUDABLE SALES CONVENTIONS

A practice which is growing rapidly, all over the country, is that of calling all of the salesmen, both travelling and local representatives, together for a long and very thorough discussion of the new models, and in particular the changes about to be advanced. This is one that is worthy of commendation. It results in the widest possible discussion both pro and con, of the newer features, which cannot help but be a benefit to the purchaser in the long run. Put in another way, this discussion represents the voicing by the man who sells, of the wants of the man who buys, that is, the ultimate consumer.

MANY CHICAGO AMATEURS IN RELIABILITY RUN

CHICAGO, Sept. 19—Tables were turned by the Chicago Automobile Club on its friendly rival, the Chicago Athletic Association, last Thursday when the two organizations met in their second annual inter-club reliability team match. Captain N. H. Van Sicklen's clever pilots captured the honors, which in this case meant the huge shield which is up for perpetual competition between the two clubs. Another bit of plunder that fell to the lot of the Automobile Club men was a cup put up by F. H. Rawson, treasurer of the C. A. A., to become the permanent possession of the winning club, which in this instance was the C. A. C. There wasn't much difference between the two teams, a matter of only 23.46 points, and in a way the Cherry Circle had it on its conqueror in that it returned eleven perfect scores out of a possible thirteen, while the winning team had three down out of ten. The gross score was 180 points for the C. A. A. and 115 for the C. A. C. The loser's total was decreased, though, by the fractional penalization made necessary by the uneven sides—thirteen on one team and ten on the other.

The run, though, demonstrated that the amateurs are really better drivers than they thought, for of the twenty-three that made the 150-mile journey Thursday eighteen of them went through without mechanical trouble or being late at controls. The 18-mile an hour schedule was easy to maintain, and only two penalizations were for being late at controls. Those who got into trouble were Frank X. Mudd, T. J. Hyman and F. R. Robbins, of the Chicago Automobile Club team, and R. T. Laughlin and Charles T. Knisely, of the C. A. A. Mudd started out with a leaky radiator, which bothered him all the way, and, coupled with tire trouble made him late in getting home. Hyman was penalized for two motor stops, and Robbins was demerited for being late in checking in at the noon control, caused by stopping at Crown Point for gasoline and imagining the time he took for this would be deducted from his schedule.

On the other side of the fence, Laughlin drew the biggest penalty, brought about for work done on his car at Cedar Lake, and Captain Knisely was penalized for motor stops. Otherwise the Cherry Circle forces were in good order and went through the test like veterans.

The conditions of the match were not as strenuous as prevail in some of the reliability runs. Being open only to owners who were in no way affiliated with the motor trade, there was no demand for a technical examination of the cars, the run being more in the nature of a test of driving ability than of the cars. Therefore the demerits were handed out for motor stops, for repairs, adjustments or replacements and for being late at controls. These were just enough to make the match a sporting proposition and close, in that the chances of many being penalized were slight.

As laid out, the course took in 150 miles, mostly in Indiana, the route running into the Hoosier state through the old channels and making Cedar Lake the noon control. Cedar Lake is on the western leg of the Cobe cup circuit, and naturally that historic course was an object of interest, so it was included in the route. From the noon stop the contestants bore away from Crown Point to Valparaiso and from there came in through Hobart and Highlands. The roads were in splendid condition except for the entrance into Chicago, which was as usual in poor shape. The report of the judges was as follows:

CHICAGO AUTOMOBILE CLUB.

Car No.	Driver	Car	Score
1	N. H. Van Sicklen	Apperson	Perfect
3	Frank X. Mudd	Ford	60 points
5	Walter Egermann	Rambler	Perfect
9	Carroll Shaffer	Stevens-Duryea	Perfect
11	B. B. Ayers	Cadillac	Perfect
15	T. J. Hyman	Chalmers-Detroit	50 points
17	R. O. Evans	Apperson	Perfect
19	Godfrey Baackes	Peerless	Perfect
21	Sidney S. Gorham	Jewel	Perfect
23	F. R. Robbins	Stoddard-Dayton	5 points

CHICAGO ATHLETIC ASSOCIATION.

2	C. T. Knisely	Palmer & Singer	35 points
4	S. W. Hamm	Locomobile	Perfect
6	R. T. Laughlin	White	145 points
8	W. C. Thorne	Palmer & Singer	Perfect
10	H. N. Scott	Locomobile	Perfect
12	H. C. Knisely	Premier	Perfect
14	G. F. Griffin	Peerless	Perfect
16	E. E. Vail	Stoddard-Dayton	Perfect
18	Albert Coon	Stoddard-Dayton	Perfect
20	F. W. Wentworth	Rambler	Perfect
22	Eugene Benzat	Stoddard-Dayton	Perfect
24	W. E. Davis	Mitchell	Perfect
34	C. C. Ireland	Stoddard-Dayton	Perfect

ROBERTSON AGAIN IN FAIRMOUNT

PHILADELPHIA, Sept. 20—Robertson, last year's winner of the Fairmount Park 200-mile stock chassis race, will try for the honors at the second running of that fixture, Saturday, October 9. It is not yet known just what entry he will drive, but in all probability it will be the Bergdoll Simplex. Other shining lights who will be at the wheels of the various flyers are Len Zengle, the ex-Chadwick crack, who, although now with his first love, the Pennsylvania, will drive the Chadwick entry; Willie Haupt, also an ex-Chadwickite, who will guide one of the Bergdoll Thomases; "Bill" Wallace, who hopes to land his Palmer-Singer in front, and Herbert Lytle, who is banking on his Apperson Jack Rabbit. Mulford will in all likelihood drive the Lozier entry. As two Chalmers-Detroit entries have been promised, Lorimer and Dingley are also likely to be in the line-up.

SIMPLEX VICTORY AT LOWELL SUSTAINED

LOWELL, MASS., Sept. 20—The awards as first given out in the National Stock Trophy race at Lowell were sustained by the Contest Board of the A. A. A. The Simplex, which finished first, was protested by two other contestants on the ground that it carried a special chain-oiling device. The technical committee made an investigation in the Simplex factory and discovered that the device in question will be, as was claimed at the time, a part of the Simplex stock equipment in 1910.

BRICK FACE FOR INDIANAPOLIS TRACK

INDIANAPOLIS, Sept. 20—After deliberating over the question since the recent speedway races, which ended so disastrously, the management of the Indianapolis Motor Speedway has decided to resurface the course with brick. This decision is the result of tests made on the track. The brick is expected to give a fast and durable surface and to provide a good hold for the tires in any kind of weather.

A shed for housing airships during the aviation meet next month is nearing completion. This building will be 300 feet long and 60 feet wide, and will accommodate two dirigible balloons, fully inflated, or several aeroplanes.

PACKARD WINS RACE TO EL PASO, TEX.

EL PASO, TEX., Sept. 17—C. A. Root and W. M. Jones arrived here this morning in their Packard from New York, having traveled 3,872 miles. They left New York August 22, in company with a Mitchell and Cleveland. The former dropped out in Chicago, and the latter has not been heard from for several days.

DE PALMA MAKES ANOTHER TRACK RECORD

GRAND RAPIDS, MICH., Sept. 18—At the State fair yesterday De Palma and the Fiat *Cyclone* broke the track record for 25 miles. His time was 22:59 3-5. The previous record, also held by De Palma, was 23:35.

THE STRUGGLE FOR RAW MATERIAL AND SPACE

DETROIT, Sept. 20—Preparations being made to build automobiles are on so vast a scale that the market for raw material is rapidly being depleted. Besides the many new companies that are forming, some of which are so well advanced that they have models on the road, the established concerns of magnitude are enlarging their plants, in numerous cases more than doubling the output.

In the meantime producers of raw material were not prepared for so vast a business, and would have been pressed in furnishing barely the amount of material used in 1909, for the cars that were but recently finished. Under the circumstances, the vast increase in the number of automobiles being built, has resulted in a famine of raw material, and parts makers are all working up to the limit, with plant increases going on, governed, not by the amount of business they can command, but by the amount of raw material they are able to definitely contract for.

Glancing over the situation in general, without attempting to cover the ground in anything like a thorough manner, leads to the conclusion that the makers of cars are preparing to do their own work in so far as it is possible to do so, and many of the parts establishments are tied up by contracts which practically mean that they have been annexed to makers of automobiles on a large scale.

In Buffalo, for illustration, the Pierce-Arrow Motor Car Company is adding to its splendid concrete buildings, to an extent which will probably allow of doubling the output. The E. R. Thomas Motor Company is making additions to buildings such as will almost completely draft the remaining available ground, and this work is so far advanced that the Thomas output will be easily double what it was for the last year. The Sterling Engine Company is just finishing up its last season's work, having done more marine work than ever before, and plans are maturing for a large addition to the plant, which includes a wing to the back of the main building almost, if not quite, equal in floor space to the present plant.

Cleveland Shops Are Overcrowded—What is true at Buffalo is simply duplicated at Cleveland, and one of the best indications of the rate at which cars are being built, will be found in the numerous parts shops located there. The Perfection Spring Company, for instance, added on to its plant on a basis of 200 per cent, and with this condition barely established, the company is confronted by the need of more room. In plants like the Winton Motor Carriage Company, the situation is a little less congested, due, perhaps, to specializing on a class of relatively high-priced cars, and to years of experience along this line, thus rendering it possible to foresee wants.

Great Activity Centered at Detroit—McCord Manufacturing Company, with vast resources for turning out such accessories as radiators, force feed lubricators, fans, etc., has near to completion a new building which will enable the company to build at least 50,000 more radiators this year, and, subject to ability to make deliveries, the company is threatened with more than this amount of business in addition to booked orders which will task the entire plant. The new disc fans by the way, which this company is making a specialty of, are in great demand, and they differ from the usual product in that the blades are made in dies, all at one time, and are mounted on a hub construction of pressed steel. This branch of the company's factory is working, like the rest, 23 hours out of every 24.

The Regal Motor Car Company, with 2,000 of Model 30 on the road, as the effort for 1909, is spreading all over the block of ground, where once the Regal occupied but a small space in a single building in the middle of the same block. Work on the Regal evolution, which is the 1910 revise of the 1909 Model 30, is so far advanced that there is assurance of a big increase over the 1909 output, especially since the commodious new building is now housing the car assembly work, and affords space for important detail performances as well. The Regal is one of the companies which is not suffering so much from a famine of material, due to having a foundry of its own, and the Regal car will therefore reflect a certain stability.

At the plant of the Ford Motor Company, foresight is represented by a yard full of chassis frames, motor cases by the half acre, cylinders and other parts to match, rather tending to show that Henry Ford does not intend to participate in a material famine.

At the plant of the E.M.F., the new building is advancing near to completion; it promises to house much additional work, yet, at the same time, the company is building cars all over the yard, as well as under roofs, so that the high pressure system imposed by the management scarcely takes notice of such details as roofs and floors.

The Studebaker-Flanders organization keeps the "wiseacres," in the lobby of the "Pontchartrain," working overtime, "doping" out stories of one kind and another, all of which are rose-tinted and deal in "chunks," when it comes to telling about the number of cars the company will have on the road ere snow melts, and according to them, Studebaker-Flanders methods cannot help but result in more cars this year than were turned out by all the companies combined during 1909.

During 1909, it was variously estimated that the output of all the companies was about 80,000 cars. This year, taking the square root of the mean square of "guesses," 250,000 cars will hit the mark. The average price per car will fall but just a little lower than formerly; not so much so, perhaps, as some may think, even counting 25,000 cars at $750 each, which, according to Mr. Flanders, in his interview of a day or two ago, with the writer, was the figure set by him for the quantity of cars the company would turn out.

To put out this number of cars within a single year, requires much effort at the command of men who know how to do things, and real estate activity in and around Detroit, involving the name of Studebaker-Flanders rather goes to clinch the contention that the attempt is being made.

The Studebaker-Flanders organization is loath to disclose its real estate plans. Mr. Flanders stated to the writer that newspaper statements of late were far from the truth, and, as a matter of fact, it is too early to expect anything from this source.

Brush Runabout Company, with seven new models, is probably making as good a showing as is possible for any organization. Nothing but a well organized establishment could undertake so large a task with the hope of cleaning up the shop orders on time. The trouble is that the Brush runabout is much in demand, its road performance is pronouncedly in favor of a large future, and the company is rapidly eating into all the spare room the Briscoe Manufacturing Company can afford to give up in view of a most extraordinary rush of business in its own line. Briscoe radiators are in greater demand than ever, and the booked orders are simply up to the limit of shop capacity. Briscoe has other plans in a large way.

In the Cadillac plant, everything is so standardized under the able guidance of H. M. Leland that each day's progress is definitely decided upon, at each morning's conference, and the work in the shop goes on almost uneventfully. The Cadillac is one of the companies which operates its own foundry, builds its own radiators and other parts, and is independent of outside ordering.

Anderson Carriage Company is pushing electrics in a surprising way and the big new plant is busy almost to overcrowding. This company, it will be remembered, are the builders of the well-known "Detroit Electric." This company turned out but 78 cars two years ago, while the output for the past season has increased to 525. For the ensuing year, plans now under way, will result in a production which totals 1,000 electrics. The company is now working 465 men and rapidly increasing this force.

FIRST SOUTHERN NATIONAL SHOW PROMISES GREAT SUCCESS

ATLANTA, GA., Sept. 20—Diagrams have been made out showing the arrangement of the exhibitors at the Atlanta National Automobile Show, which will open November 6. Practically every American automobile manufacturer of note and a number of foreign machines are represented. Altogether, there will be about sixty exhibitors of complete cars, and in addition many accessory concerns. The latter, represented by the Motor & Accessory Manufacturers' Association, will receive notice of their allotments of space within a few days. Several late applications were received, among which were those of the Studebaker, E. M. F. and Autocar companies. Now that the assignments of space to these late comers have been made, practically every square foot has been taken.

The Atlanta show will be the first to be held during the winter, and as most of the 1910 models have already been announced, it is probable that they will form the great majority of the exhibits. Thus the Atlantans and their visitors will have the first opportunity to see the various types for the coming year side by side and compare their merits.

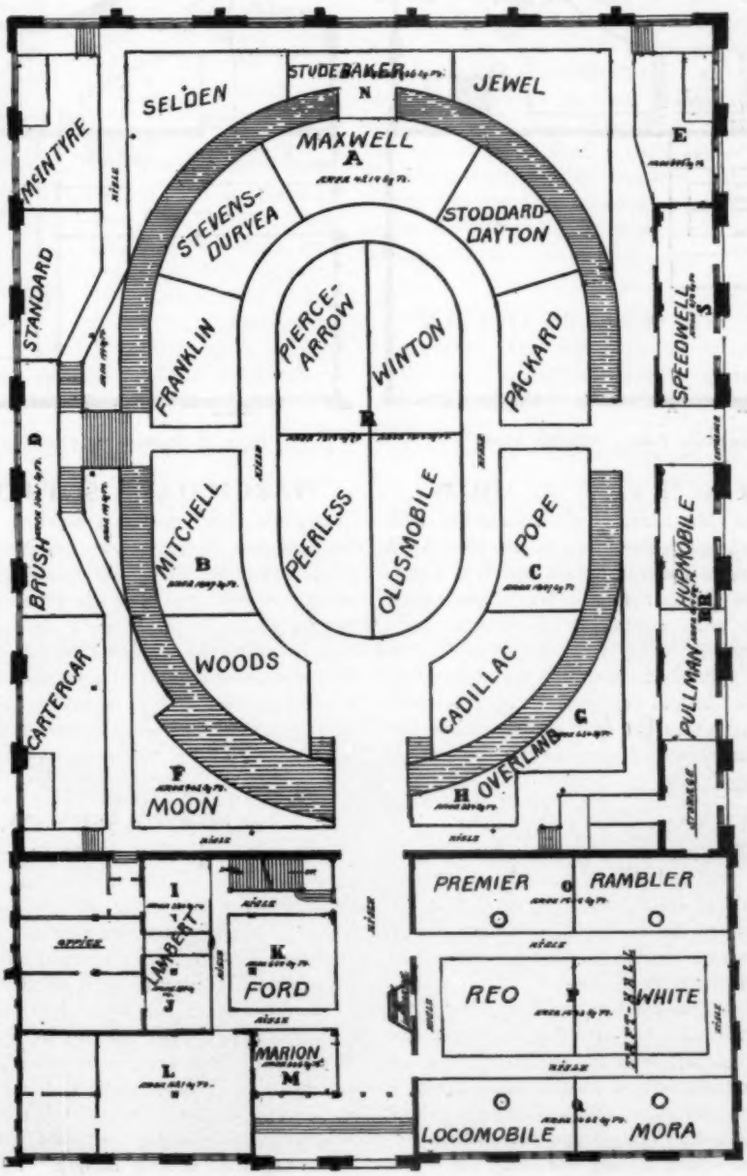
The show will not be the only attraction in Atlanta, however. During the same week will be held the opening meet on the Atlanta Speedway, which the Southerners claim will eclipse that of Indianapolis. In general, the week will be a time of festivity, in which Southern traditions of hospitality will be given full play. Merchants and capitalists of the city have raised a fund of $20,000 for the entertainment of the city's guests, and the whole region of Peachtree street will be put in gala attire.

Among the prominent firms reserving space on the main floor are many that are well known all over the country, all of the larger firms being represented. The publication of the diagrams has been a source of great surprise to those not in close touch with Southern affairs, for so representative a list is seldom seen outside of the New York and Chicago shows. The complete list of main floor exhibitors is:

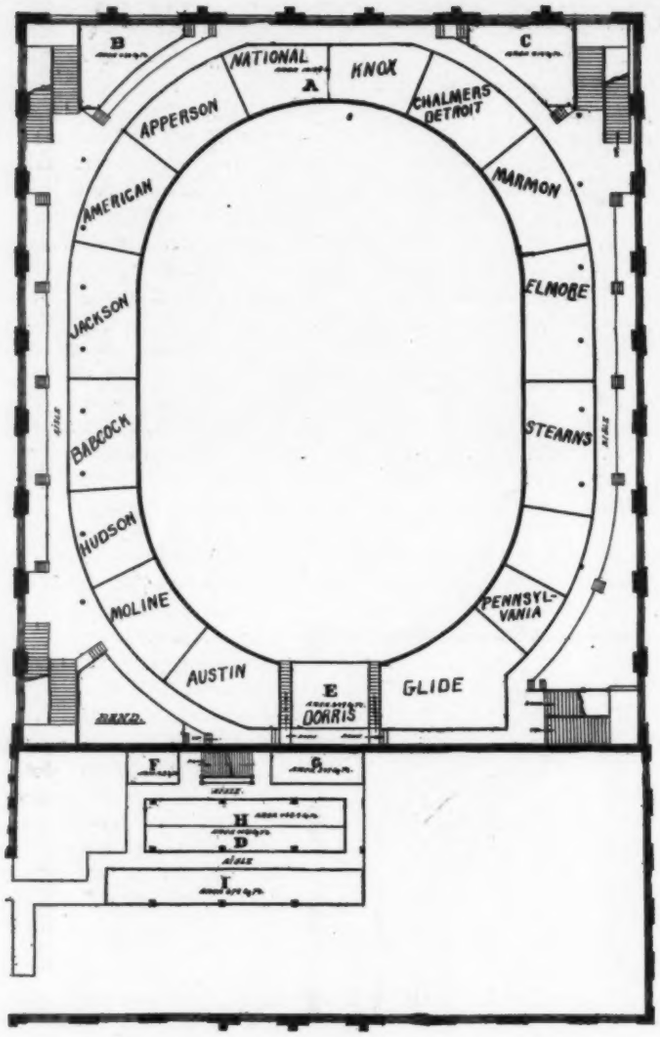
Pierce-Arrow Motor Car Company, Peerless Motor Car Company, Packard Motor Car Company, Winton Motor Carriage Company, Pope Manufacturing Company, H. H. Franklin Manufacturing Company, Stevens-Duryea Company, Cadillac Motor Car Company, Maxwell-Briscoe Motor Company, Dayton Motor Car Company, Mitchell Motor Car Company, White Company, Woods Motor Vehicle Company, Reo Motor Car Company, Locomobile Company of America, Mora Motor Car Company, Premier Motor Manufacturing Company, Thomas B. Jeffery & Co., Ford Motor Company, Marion Motor Car Company, Buckeye Manufacturing Company, Moon Motor Car Company, Overland Automobile Company, Cartercar Company, Brush Runabout Company, St. Louis Car Company, McIntyre Company, Selden Motor Vehicle Company, Croxton-Keeton Company, Studebaker Automobile Company, Speedwell Motor Car Company, York Motor Car Company, Hupp Motor Car Company.

This absolutely fills all of the first floor spaces except two, both of them rather small, and both located in somewhat out of the way places. The rest of the ground floor is taken up with the administrative offices, dressing rooms, storage spaces and other similar but small amounts of floor space which could not possibly be used as exhibition spaces.

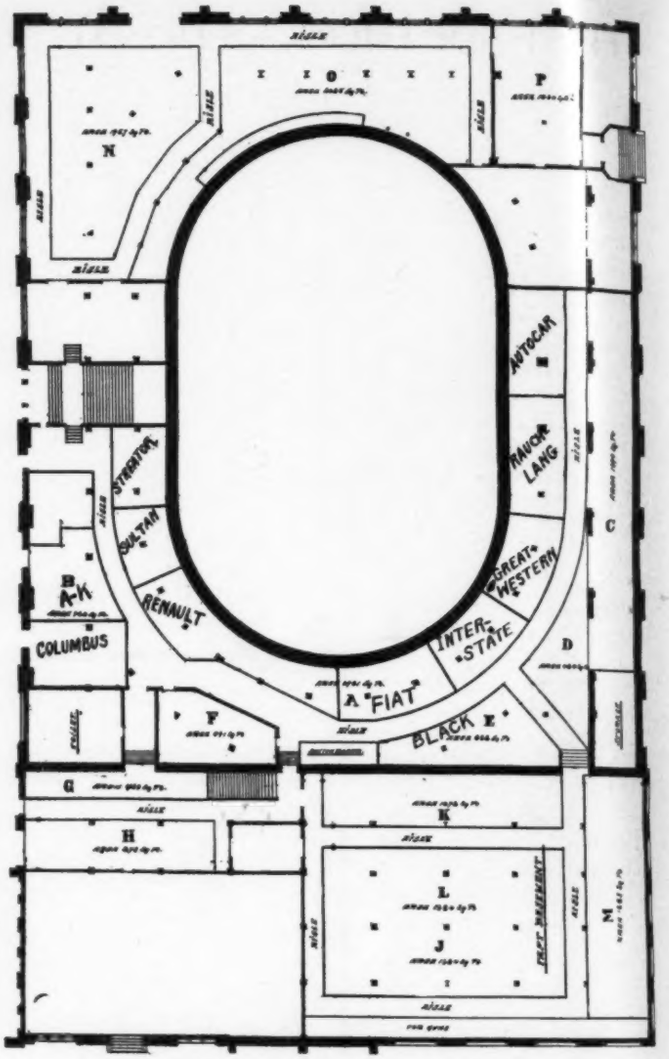
On the mezzanine floor visitors to the show will find the following exhibitors: Austin Automobile Company, American Motor Car Company, Apperson Brothers Automobile Company, Babcock Electric Carriage Company, Chalmers-Detroit Motor Company, Dorris Motor Car Company, Elmore Manufacturing Company, Bartholomew Company, Moline Automobile Company, Hudson Motor Car Company, Pennsylvania Auto Motor Company, F. B. Stearns Company, Nordyke & Marmon Company, Jackson Automobile Company, National Motor Vehicle Company, Knox Automobile Company. This leaves but five bare spots on the whole floor, which will be taken up without a doubt by the late comers. Proceeding to the basement, one finds located there the following firms: Renault Freres Selling Company, Fiat Automobile Company, Inter-State Automobile Company, Great Western Automobile Company, Rauch & Lang Carriage Company, Autocar Company, Streator Motor Car Company, Sultan Motor Company, Black Manufacturing Company, Allen-Kingston Motor Car Company, Columbus Buggy Company. This leaves only fourteen more spaces to be filled up before the curtain goes up on the greatest automobile show ever held in the sunny South. A number of manufacturers who failed to realize the National, as well as sectional, importance of the show in time for the first allotment will doubtless snap up these spaces long before the opening date.



Plan of Main Floor of the Atlanta Automobile Show



Arrangement of Mezzanine Floor, Atlanta Show



Plan of Basement, Showing Various Subdivisions

APPLY SOON FOR A. M. C. M. A. SHOW

The American Motor Car Manufacturers' Association calls attention to the fact that applications for space in the New York show, which opens in the Grand Central Palace on New Year's Eve, must be received before October 1 in order to participate in the first allotment. Last year a number of concerns were unable to secure any space at all, owing to their failure to file their applications within the appointed time, and the show committee of the A. M. C. M. A. desires this year to be free from such disappointments. In past years the first allotment has disposed of the entire 72,000 square feet of space in the Palace.

DEATH ENDS TRANSCONTINENTAL

PHILADELPHIA, Sept. 20—The transcontinental relay trip promoted by the *Press* of this city, and which started promptly at 12:30 P. M., Saturday from City Hall, came to an abrupt termination before the completion of the first relay, when the Acme, driven by Clifford R. Ely, which was to cover the first leg of the journey, met with an accident at Robesonia, ten miles beyond Reading. Henry L. Buckley, automobile editor of the *Press*, one of the two messengers, sustained a fractured skull, dying two hours later at the Reading hospital; William H. Brown, a guest of Driver Ely, is in a serious condition at the same hospital. Ely, his assistant, and another passenger, suffered slight cuts and bruises. The car was wrecked. The *Press* authorities immediately wired all along the route, calling the relay off. The cause of the accident has not yet been ascertained.

MARCH DATE SET FOR BOSTON SHOW

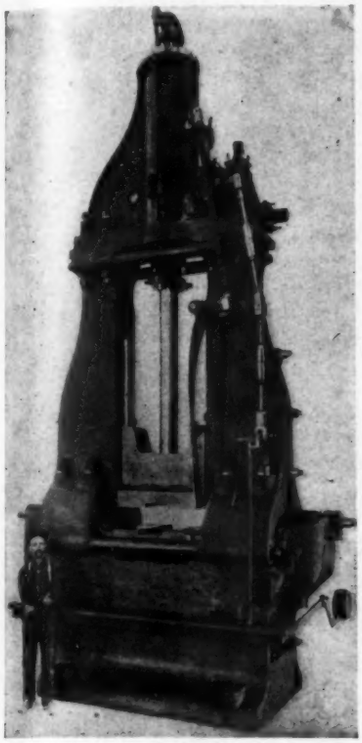
BOSTON, Sept. 21—At a meeting held recently, it was decided to hold the Boston show, this being the eighth annual for the Hub classic, in Mechanics Building on March 5 to 12, 1910. Indications now point to the greatest show ever held, while the management is planning a decorative scheme which will be equally as much of a record breaker. Manager Chester I. Campbell and an able corps of assistants claim to have planned decorations described only by such language as "the most elaborate yet, and of a grandeur never before attempted." The floor diagrams and other printed matter are now in the hands of the printer.

2,456 GUESSES ON PREMIER RUN

PHILADELPHIA, Sept. 20—Owing to the fact that no less than 2,456 residents of towns along the route of the recent Premier reliability run from this city to Cape May had sent in guesses as to the number of the winning car and the time in which the 96 miles would be covered, it was impossible to announce the official figures until Wednesday. B. E. Block, of Norristown, the winner of the cup, drove his car over the course in 4:57:45, just sixteen seconds slower than the official time. But one of the guessers selected Mr. Block's car, number 29, and that was James Martin, of Waterford, who took down the biggest bit of cash hung up by the promoters. Elizabeth McCarthy, of Germantown, whose guess was but an even ten seconds shy of the official time, captured second money. Twenty prizes in all were thus distributed.

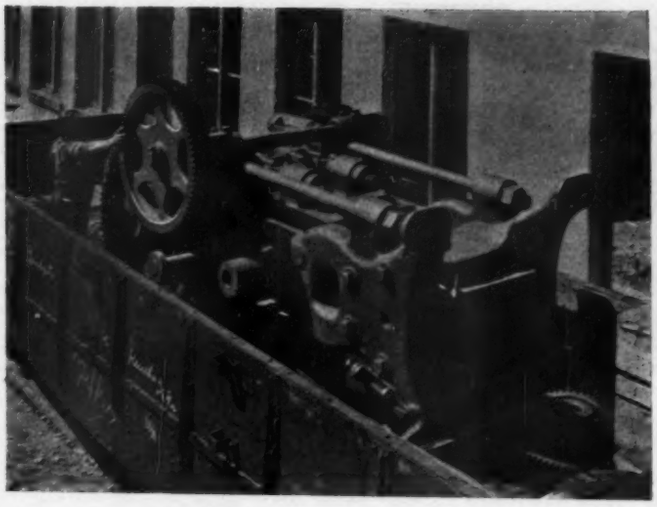
NEW RAMBLER FACTORY AND MACHINERY

KENOSHA, WIS., Sept. 20—The Thomas B. Jeffery Company has made extensive additions to its plant recently, which, when completed, will entirely change its appearance. The new buildings, owing to the abundance of land at the company's disposal, have been made only one story in height, and will give the workmen all the light and air that could be desired. They are of reinforced concrete, with saw-tooth roofs made up almost completely of glass. Some idea of the extent of these buildings may be gained from the photograph.



Rambler Steam Forging Hammer

Two of the machines to be installed in this addition to the plant are also shown in the illustrations. This new machinery is expected to facilitate and cheapen the manufacturing processes to an unusual degree. The steam drop-forging hammer, to be used in the making of crankshafts, connecting rods, front axle yokes, and other heavy forgings, weighs complete 49 tons. The hammer itself weighs 3,500 pounds, and the anvil block 35 tons. The machine will be installed on a foundation of solid concrete sixteen feet deep and fifteen feet square. Another machine which comes in the same heavy-weight class, and which in modern manufacturing methods is equally important, is the 500-ton drawing press, for making brake drums, clutch cones and other parts of drawn steel. This press weighs complete 30 tons. Such equipment follows the policy of spending money to save money.



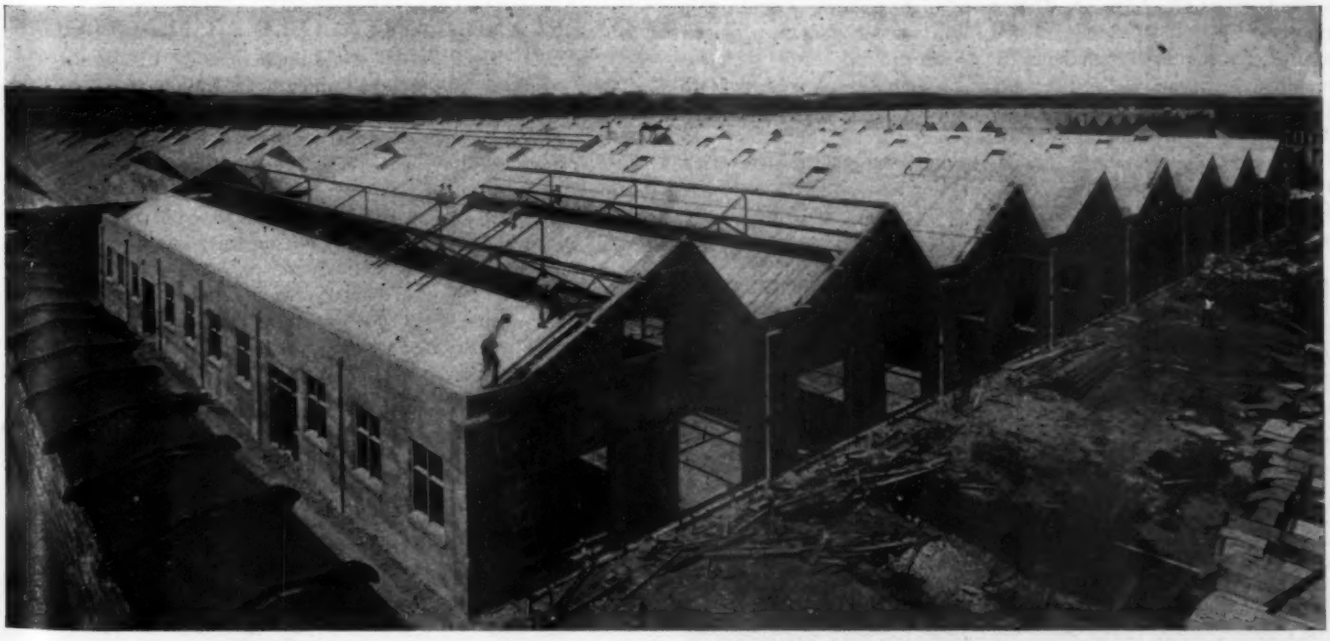
Drawing Press in Car Alongside New Rambler Factory

ENGINEERING EXHIBIT OF FULTON RELICS

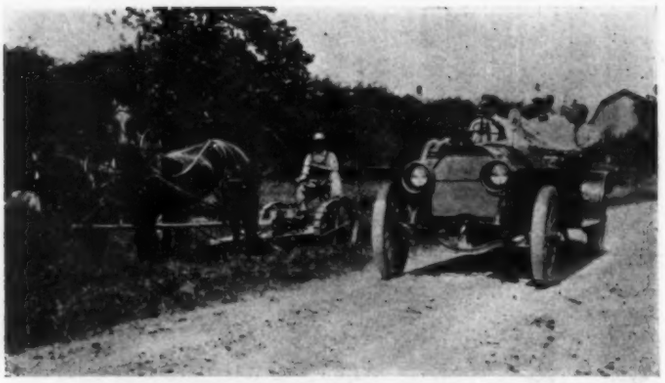
The Hudson-Fulton celebration is essentially a recognition of the engineer and the explorer. To show the progress of engineering science, models of the Clermont and other early steamboats, through the courtesy of the Smithsonian Institution, are now on exhibition at the rooms of the American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York. The exhibit includes the Clermont, the Phoenix, built by John Stevens, and one of John Fitch's early types. By way of contrast, the Hamburg-American line has loaned the exhibit a beautiful model of the *Deutschland*, showing one of the highest developments of steam navigation. The exhibit will be open to the public every week-day from 9 a. m. to 5 p. m.

SELLING BRANCH FOR SPARE WHEELS

ST. ANNE, ILL., Sept. 20—The Spare Motor Wheel Company, of this city, maker of Stepney spare wheels, has disposed of its entire output for the coming season to the American Stepney Spare Wheel Company, of 1773 Broadway, New York, who will in the future have entire charge of the disposition of this product. The St. Anne company has enlarged its plant and equipment, and is manufacturing clincher and other rims besides spare wheels.



Addition to Rambler Factory: This Wing for Accommodation of Laboratory and Motor Testing and Repair Departments



Hoblitt in Alco Asks His Way of an Ohio Farmer

A BUSINESS TOUR OF 5,000 MILES

Five thousand miles was the sum total of a business tour recently completed by F. M. Hoblitt, the pioneer automobile salesman, who is now with the American Locomotive Company. Mr. Hoblitt made his start from New York City, driving to the Alco factory at Providence, then to Boston, and from there to Albany and Buffalo, Cleveland, Chicago, Minneapolis, St. Louis, and all through the Middle West. He said he encountered only a few bad roads, the worst being in Southern Indiana, where rains had caused the Muscatatuck River to rise so that the road was flooded in places. He says: "Most of the time I found good roads and twenty-five per cent. of them were splendid, although I had a car, of course, which makes the worst roads seem fair. The country seemed prosperous everywhere, and I could see nothing but the best of prospects in a business way. I suppose it is known here now, for it is some time since I went over it, but all tourists should be told that the new State road between Albany and Buffalo, which has been so much avoided, is now practically finished all the way." Mr. Hoblitt met with the usual experiences of the road, some laughable and some annoying. In Kentucky the drivers of teams and carriages seemed particularly timid, although the horses gave little trouble. It was during the first weeks of this trip that the famous adventure of the horse-fly occurred, which was widely published in the trade papers and caused great merriment among Mr. Hoblitt's friends, who are sure to remind him of it when he returns.

HOW LEBANON, O., STOPPED SPEEDING

COLUMBUS, O., Aug. 30—Drivers of automobiles between this city and Cincinnati are confronted by a most efficient sign placed at the city limits of Lebanon. The inscription reads: "Automobilists! Speak well of Lebanon. May we speak well of you? Drive Slowly." The result of this polite and reasonable request is that the tourists invariably reduce their speed on the city streets, and there has been less of the fast driving in that place than at any en route. The signs might well be copied by towns which are trying in vain to stop the trouble by imperative warnings of arrest for violations.

An Effective Sign for Speeders at Lebanon, O.

WHAT TIRE-TOWN MEN ARE DOING

AKRON, O., Sept. 20—The Firestone Tire & Rubber Company has purchased 15 acres of land in South Akron for a new plant to take care of its increased business. The land will be used for a group of large buildings constructed and equipped after the most approved designs, which will be devoted to the manufacture of automobile tires. H. S. Firestone said, in discussing the project, that the company had been offered inducements to go to other cities, but preferred to remain in Akron on account of the facilities and supply of skilled labor to be found there. The Firestone Company entertained its branch managers and salesmen at a banquet last week, held in connection with the annual convention.

W. W. Wuchter, the new manager of the Swinehart Clincher Tire & Rubber Company, announces that the pneumatic tire to be manufactured by that company next year will differ in many respects from the standard type. Details, however, have not been announced. Two new buildings will be erected, one 40 by 100 feet, to be used by the solid tire department, and one 60 by 125 feet for pneumatic tire manufacture. Three new branches, in Boston, Buffalo, N. Y., and Philadelphia, will be established.

Knox that Won First Prize at Recent Westfield Parade

At a recent automobile parade at Westfield, Mass., the winner of the first prize in the decorative division was the Knox car, owned by H. P. Moseley, a leading lawyer of that city. The flowers used in the decorations were wistaria

OVERLAND CAPITALIZED AT $1,500,000

TOLEDO, O., Sept. 20—At the annual meeting of the directors of the Overland Automobile Company in Indianapolis last week a complete reorganization of the company was effected. The capital stock has been increased to $1,500,000, this being deemed necessary on account of the rapid expansion of the company's business, and the name has been changed to the Willys-Overland Automobile Company, in recognition of the prominence of President J. N. Willys in the company. Contracts have been awarded for an addition to the Toledo plant to be 91 by 397 feet and three stories in height. This is the second addition since the Overland company took possession a few months ago. This structure will be located on the five-acre plot of ground which was recently purchased.

TAXICABS FLOURISH IN BALTIMORE

BALTIMORE, Sept. 20—The taxicab business is certainly flourishing in this city. The latest deal is the purchase of the Belvidere Hansom Company by the Taxicab Company of Baltimore. The latter, by this purchase, gains the right to serve all the hotels of the city, except the Rennert, and the Union Station, and during the next month will place 28 additional cars in service. The company has leased the stables at 413 North Howard street and will convert them into a garage. The Rennert Hotel is to use the taxicab service of the Harry L. Stewart Company.

President Taft in Chicago with Four Chalmers-Detroits as Guard of Honor

On the occasion of the President's recent visit to Chicago there was held an automobile parade through the parks, in which he took a prominent part. Although seated in a Thomas "Six," Mr. Taft had for an escort four Chalmers-Detroit cars, each carrying, besides the driver, a member of the police or Government secret service

Commercial Car from Spokane, Wash.—The Spokane Motor Car Company has been incorporated with a capital stock of $600,000 to manufacture an automobile truck with a four-wheel drive. The company is headed by V. E. Funkhouser, president; Edward Schulmerich, vice-president; F. M. Skiff, secretary; A. L. MacLeod, treasurer, and Thomas Bilyeu, general manager. The truck is claimed to be capable of very short turns, and can pass over considerable obstacles without disturbing the level of its platform. Models will be built of capacity from one and one-half to seven tons. The factory will be located at Spokane, and, it is said, will employ 150 men.

Stearns and Fisk Good Combination—George C. Row, of Chicago, who has just completed a trip from that city to San Francisco in his Stearns car, says that he was surprised by the remarkable performance of his Fisk tires. In crossing the Rocky Mountains he had expected considerable tire trouble, but only one puncture, the work of a sharp nail, was experienced throughout the trip. Mr. Row stated that his car, with its load, weighed 6,200 pounds, and that, although the tires showed the effects of the hard usage to which they had been subjected, they were in perfectly sound condition when the Golden Gate was reached.

New Concern to Make Trucks—The Robinson-Loomis Motor Truck Company, of Minneapolis, Minn., has been organized with a capital of $50,000 to manufacture a truck to be known as the Gopher. The plant will be located on Second avenue north and Seventh street. Besides making the new truck the company will continue to act as agents for the Reliance trucks. T. F. Robinson is the president of the new concern; F. P. Robinson, vice-president, and F. L. Loomis, secretary. Mr. Loomis was formerly sales manager of the Reliance Motor Truck Company, of Detroit and Owosso, Mich.

Firestone a "Live One"—Several New York automobilists who use Firestone tires were winners at the Sheepshead Bay track last week by playing a rather unusual tip. While looking over the list of starters one of them discovered a horse named Firestone entered in the fourth race. Though he knew nothing of horse racing or of the merits of the entries, he liked the name, and, with several of his friends, he bet on the horse. Firestone upheld the honor of his name by coming home a winner, and the users of Firestone tires left the track with $4 in their pockets for every one they had bet.

Maxwells Score at White Plains—In the races held under the auspices of the Westchester Driving Club on its half-mile track at White Plains, N. Y., recently, the two 22-horsepower Maxwells which had just returned from the Lowell meet made a clean sweep in the 10 and 15-mile events. In the former Thomas Costello and Arthur See took first and second honors, and were at no time in danger of being overtaken. The winner's time was 14:20. The 15-mile event was closely contested. Costello was first in 21:32, a Mercedes second and See third.

Reo Successful in Wilmington Service—A Reo car, purchased recently by the city of Wilmington, Del., for the use of its street and sewer department, is proving a great success. It is used by the directors in trips of inspection and has greatly facilitated the work. The Reo is the first machine to be bought by the city but more are contemplated, and the fire department is making arrangements to add two automobile fire engines to its equipment. Negotiations are already progressing with the manufacturers of these cars.

Ohio Electric Company Reorganized—The Ohio Electric Company, incorporated during the past week by H. P. Dodge and other Toledoans, with a capital of $75,000, will take over the business of the Ohio Electric Carriage Company, which was organized some months ago for the manufacture of electric vehicles. For the present the company will only assemble the various parts which are to be made under contract, but ultimately it is the intention of the company to build a factory with sufficient capacity to build the greater portion of their machines.

W. C. P. Taxis Parade at Coney—In the Mardi Gras parade at Coney Island, the climax of the season at New York's popular seashore resort, Police Inspector O'Brien and Captain Fennelly, with the executive committee of 26 men, headed the line in the yellow taxicabs of the W. C. P. Company. The cabs were artistically decorated and drew much favorable comment through their fresh and clean appearance, in spite of the fact that most of them have been in hard service since June 1.

Franklin Crosses Mont Cenis—George T. Odell and party, of Salt Lake City, Utah, have just returned from a 9000-mile European tour in a six-cylinder Franklin. They crossed Mont Cenis on the new road at an altitude of between 7000 and 8000 feet. There was considerable snow met with, but the 30-mile run between Mondane and Sousa was made in an hour and a half. Another achievement was the climbing of Mount Vesuvius to a point beyond that reached by the tramway.

Driggs-Seabury Drops Ordnance—The Driggs-Seabury Ordnance Corporation will discontinue the manufacture of ordnance as soon as contracts on hand are filled, according to reports. The company henceforth will devote all its time to the manufacture of automobile parts. Since that branch was taken up some time ago orders have been coming in rapidly and at present there is enough work on hand to keep the factory busy for several months.

Hoosiers Want a Truck Factory—At a meeting of Ft. Wayne, Ind., capitalists recently it was voted to finance the transfer of the Coppock Motor Car Company, of Decatur, Ind., to that city. A thorough investigation gave very favorable results and it was decided that the establishment of the factory in Ft. Wayne would be beneficial to the interests of the city. It is planned to raise $100,000 capital to finance the company.

Hartford Company Elects Officers—At the recent meeting of the directors of the Hartford Auto Parts Company, of Hartford, Conn., W. H. Caldwell was elected president and treasurer, F. H. Bogart, vice-president and manager, and F. L. Martin, secretary. Messrs. Caldwell and Bogart, and T. H. Brady, J. J. Amgulatis, John Boyle and E. W. Putnam were elected directors.

Connecticut Authorities in Earnest—That the Connecticut secretary of state means business, and will not tolerate the reckless operation of automobiles, is made plain by the revocation of a license announced in the case of the driver of G. A. Schwartz of Chicago, who maintains a summer home in Suffield. The driver in question struck a pedestrian a few days ago.

Whitney Parts in Demand—The Whitney Manufacturing Company, of Hartford, Conn., plans an immediate addition to its present four-story structure in order to accommodate its increasing business. A temporary addition will be built to enable the company to keep pace with its orders during the winter, and in the spring a permanent concrete addition will be built.

Philadelphia Supply-Men Picnic—The annual Labor Day picnic of the employees of the big Philadelphia accessories establishment of James L. Gibney &

Brother was held this year at Hamilton's Farm, near Chester. The Benedicts slaughtered their unmarried fellow-workers at baseball by the score of 35 to 15.

New Six from an Illinois Town—C. E. Lipman, of Beloit, Wis., a manufacturer of automobile parts, is interesting the capitalists of Rockford, Ill., in his plans for a six-cylinder, 36-horsepower car, which it is proposed to name the "Rocoit." If the plans are carried out, production will begin about January 1. The car will sell for less than $2000.

Clever Thermoid Advertising—Automobile dealers have been periodically receiving ingenious folding post-cards from the Thermoid Rubber Company, of Trenton, N. J., extolling the virtues of Thermoid brake lining. "Good Reasons," "All in a Nutshell," "Think It Over!" and "The Stamp of Approval" are some of the titles.

New Maker of Blomstrom Cars—The Lion Motor Company, which was recently organized in Detroit, with a capital of $300,000, is to move to Adrian, Mich. The company is to manufacture the Blomstrom and Gyroscope cars, designed by Charles E. Blomstrom, of Detroit, and expects to have its machine on the market by the first of the year.

IN AND ABOUT THE AGENCIES

Elmore, New York City—Peter Fogarty and George Post has secured the Elmore agency formerly held by A. E. Ranney & Company, and will open an office on West Fifty-fourth street, near the A. C. A. club house. Mr. Fogarty held the Northern agency until that company was merged into the E. M. F., and has since been connected with the Marmon interests. Mr. Post was formerly connected with the American Panhard branch. The new firm will be known as the Elmore Motor Car Company of New York.

Studebaker, Philadelphia—The Philadelphia branch of the Studebaker Brothers Company is to give up its present quarters at 330 North Broad street to move into the 80 by 200-foot, three-story building at Pennsylvania avenue, Eighteenth and Noble streets. Manager F. V. Stratton expects to get into the new quarters in two weeks.

Oldsmobile, Baltimore—A modern building, embracing garage, sales and repair shop facilities, will soon be erected for the Baltimore headquarters of the Oldsmobile. E. L. Leinbach, the manager, is now making arrangements for the shipment of 1910 cars, and reports that his prospects for the coming season are even brighter than they were at the beginning of the present highly successful one.

Reo, Hupmobile and Oakland, Baltimore—The "Little Joe" Weisenfeld Company will occupy the building at 14 North Howard street as an auto exchange for the Reo, Hupmobile and Oakland cars. The building has four floors, and is 35 by 105 feet. It was leased by the company last week.

Kline-Kar, Philadelphia—The B. C. K. Motor Car Company, of York, Pa., which is making the Kline-Kar, has installed a branch office in the establishment of Frink & Company, the well known carriage makers, at 203 North Broad street.

Haynes, Atlanta, Ga.—The Corker Motor Car Company has been appointed agent for the Haynes in Georgia, Florida, Alabama, Tennessee and North and South Carolina. This company also holds the local agency for the Matheson.

Rambler, Brooklyn, N. Y.—Thomas B. Jeffery & Co. have made arrangements with the Kenny Motor Car Company to act as Rambler distributors in Brooklyn. A garage will be erected at Sterling Place and Bedford avenue.

Lozier, Hartford, Conn.—Brown, Thompson & Co., of Hartford, Conn., have been appointed agents for the Lozier car for the State of Connecticut, with the exception of the counties of Fairfield and New Haven.

Alco and Pullman, Philadelphia—W. C. Longstreth has secured the agency for the Alco in the Quaker City and adjacent territory, and last week announced in addition the acquisition of the Pullman sales agency.

Maxwell and Bailey, Cincinnati—The Chas. Behlen Sons Company, a prominent carriage maker of this city, located at Fifteenth and Vine streets, has taken the selling agency for the Maxwell and Bailey electric.

Pierce-Arrow, Louisville, Ky.—A company has been formed under the name of the R. H. Semple Company to handle the Pierce line in this city. The present location is at 309 West Main street.

Luco "Night Pilot," New York—This device will be sold through the Luco Night Pilot Company, 1777 Broadway.

Factory and Offices of the Fal Motor Company, at Chicago

PERSONAL TRADE MENTION

A. S. Holden, at present assistant sales manager of the F. B. Stearns Company, will assume, about October 1, the position of Western Manager, with headquarters at San Francisco. His territory will extend from Salt Lake City to the coast and from the Mexican to the Canadian boundary.

Asa Goddard, formerly president of the Worcester, Mass., Automobile Club, and later secretary of the Cleveland Automobile Club, has taken the position of general sales agent of the Kelly-Springfield Road Roller Company, of Springfield, Ohio, for which he has been fitted by his extensive experience in road-building.

James C. Howell, of Cornwall-on-the-Hudson, N. Y., has been appointed assistant manager of the Warner Instrument Company, of Beloit, Wis., to succeed Alfred S. Koto, resigned. Mr. Howell is a graduate of Columbia and has specialized in patent law.

H. J. Snider, who recently entered the employ of the H. H. Franklin Manufacturing Company as assistant to one of the office department managers, has been promoted to the management of the Albany, N. Y., branch of the company.

W. A. Rutz, formerly traveling representative of the New Departure Company, Bristol, Conn., has accepted a similar position with the Gilbert Manufacturing Company and the F. E. Bowers Company of New Haven, Conn.

Albert C. Galbraith has accepted a position with the Continental Caoutchouc Company, of New York, and will travel from the Philadelphia branch, covering Pennsylvania. He formerly represented the Diamond Rubber Company in the New England territory.

Thomas W. Simpson, formerly of the York Motor Car Company, of York, Pa., has joined the salesforce of "Little Joe" Weisenfeld, the Baltimore representative of the Reo, Oakland and Hupmobile cars.

David W. Pell, formerly superintendent of the Electric Vehicle Company in Hartford, Conn., has been made general manager of the recently organized Pell Motor Car Company, of Oswego, N. Y.

L. L. Dunlap, formerly factory manager of the Oakland Motor Car Company, Pontiac, Mich., was appointed general manager at the director's meeting this week to succeed the late E. M. Murphy.

Hobart M. Adams has been appointed general sales manager of the Royal Motor Car Company, of Cleveland. Mr. Adams formerly managed the Cleveland branch of the White Company.

Herman Eckhardt, Jr., after a year's absence, has returned to the employ of the Columbus Buggy Company, of Columbus, Ohio, as sales manager of its electric and gasoline cars.

E. B. Lausier has been appointed assistant sales manager of the Timken-Detroit Axle Company, of Detroit, and of the Timken Roller Bearing Co., Canton, O.

Ajax Cup for Runabouts in "Star" Tour

DE LISSER TROPHY FOR WESTERN TOUR

KANSAS CITY, MO., Sept. 18—Horace De Lisser, president of the Ajax-Grieb Rubber Company, has offered a handsome trophy, to be known as the Ajax Cup, for the reliability tour which starts at this city Monday. This cup will be awarded to that contestant in the runabout division, either dealer's or owner's class, who crosses the finish line with the best score. The tour, which will last five days, and cover a distance of 675 miles, will take in Junction City, Kan.; Lincoln, Neb.; Omaha, and St. Joseph, Mo.

DOUBLE SUIT OVER MOSLER PLUGS

An injunction suit has been filed against A. R. Mosler & Company by the Lehman Manufacturing Company to restrain the former from manufacturing spark plugs claimed to infringe on patents granted to J. H. Lehman October 20, 1903. The Mosler Company says that its plugs do not infringe, and intends to fight the case in the courts. On the other hand, the Mosler Company has begun a suit against the Auto Supply Company for infringement on the Canfield patent, granted October 18, 1898, covering a spark plug with a recess around the electrode for the purpose of preventing soot from gathering on the insulation. This patent, with two others, is now the property of the Mosler Company, which claims that a majority of the spark plugs now in use are infringements.

YORK-PULLMAN DIRECTORS MEET

YORK, PA., Sept. 18—The annual meeting of the board of directors of the York Motor Car Company, maker of the Pullman cars, was held this week. A dividend of 7 per cent. was declared. T. C. O'Connor was elected president, O. Stevenson was re-elected secretary and treasurer and George S. Schmidt was made a member of the board of directors and counsel for the company. A considerable amount of the year's earnings was set aside as surplus.

NEW YORK TRADESMEN'S GAMES

The inhabitants of New York's automobile row turned out last Saturday for an outing at Lange's Grove, New Dorp, S. I., and donned running pants and jerseys in place of the conventional duster and goggles. The outing took the form of a track meet, and there was some spirited competition. Although the events were open only to members of the organization, sufficient entries were received to make them unusually interesting. W. Flynn, of the Diamond Rubber Company, outscored all the other contestants, winning the 100-yard dash, the hop, step and jump.

FIRST NEWS OF EVERITT "THIRTY"

DETROIT, Sept. 20—William E. Metzger, B. F. Everitt and William Kelly, who recently disposed of their holdings in the E.-M.-F. Company to Studebaker interests, are sponsors for a new car that will shortly make its appearance. Details have been kept under cover, but it is known that the car, which is a Kelly creation, will have a four-cylinder motor developing 30 horsepower. It will be built in two styles, listing at $1,250 and $1,400. A factory has been secured, and following the incorporation of the new company, which will be effected shortly, the manufacture of cars for the 1910 trade will be undertaken. It is reported that they have purchased the Meier trunk factory on the line of the Grand Trunk Railroad, and will proceed to build a large addition, such as to permit of the building of 5,000 cars, both runabouts and touring cars, for the coming year.

DETROIT'S LATEST WARREN-DETROIT

DETROIT, Sept. 20—The Warren Motor Car Company is the latest to loom above the local horizon, where the incorporation of an automobile manufacturing concern is almost a weekly occurrence. The company is capitalized at $100,000, and the cars put out will be of the light runabout and touring type. The new machine will be known as the Warren-Detroit, and will be on the market early in 1910.

The incorporators include Postmaster Homer Warren, C. R. Wilson, of the Wilson Body Company; Harry N. Snyder, R. J. Brennan, W. H. Radford, formerly assistant engineer of the Hudson Motor Car Company; Henry C. Walters and J. Bayerline, formerly purchasing agent for the Hudson Motor Car Company.

GRAMM-LOGAN INCREASES CAPITAL

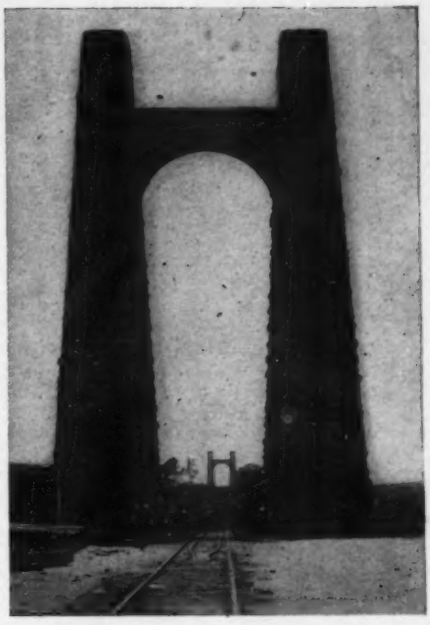
BOWLING GREEN, O., Sept. 18—The first fiscal year of the Gramm-Logan Motor Car Company, which ended this week, was very satisfactory to the stockholders. The directors declared a cash dividend and laid by a surplus fund in addition. A. L. White was elected president, B. A. Gramm was re-elected vice-president and general manager, and F. E. Lamb and J. B. Wilson were elected secretary and treasurer, respectively. It was unanimously agreed to increase the capitalization of the company from $100,000 to $300,000.

REO EMPLOYEES GET BONUS

LANSING, MICH., Sept. 20—The Reo Motor Car Company has presented its employees who have been with the company for a year a check for an amount equaling 5 per cent. of their year's wages. The wage dividend amounted to about $10,000—$3,000 more than last year at the same rate.

TAXICABS AND TRANSIT

PEORIA, ILL.—The Palace Boarding & Livery Stable of Peoria, Ill., has decided to enter the automobile taxicab business, and has placed an order with the Sultan Motor Company, of New York, for a number of Sultan machines.



Great Western at High Bridge, Ky.

C. A. Kenney, the owner of the Great Western car shown, has driven it 3,450 miles in the past two months. The "Towers," at High Bridge, Ky., were originally intended to support a suspension bridge, but after they had been built the project was abandoned.

NEW AGENCIES ESTABLISHED

Alco and Stoddard-Dayton: Providence, R. I.—Park Square Automobile Station, 17 Snow street.

American and Maxwell: Seattle, Wash.—Polson Implement Company, 926 First avenue South.

RECENT INCORPORATIONS

Fiels Equipment Company, Brooklyn, N. Y.—Incorporated by Charles E. Miller, B. W. D. Woodward, George Bender, W. A. Towner, Jr., and John P. Miller, with a capital of $100,000, to manufacture airships, aeroplanes and balloons.

Automobile Sales & Supply Company, San Antonio, Tex.—Capital $20,000. To manufacture and deal in automobile supplies, accessories and motors cars. Incorporators: Sidney H. Weis, E. A. Kalkhurst, Roy Campbell.

Cataract Motor Company, Paterson, N. J.—Incorporated by Louis A. Piaget, W. H. Sherman, F. W. Freeman, H. J. Westerhoff and G. E. Hannah, with a capital of $350,000, to manufacture motor vehicles, engines, etc.

Pell Motor Car Company, Oswego, N. Y.—Incorporated by Chauncey C. Place, Albert N. Radcliffe and David W. Pell, all of Oswego, with a capital of $150,000, to manufacture automobiles, parts, etc.

Bergen and West Side Motor Car Company, Jersey City, N. J.—Incorporated by Charles E. Collard, Martha L. Collard and Beverly D. Sparks, with a capital of $100,000, to manufacture automobiles.

E. R. Thomas Motor Branch Company, Chicago—Capital $100,000. To do a general automobile and garage business. Incorpoartors: J. Weisenbach, J. J. Cermak, J. S. McClellan.

Marquette Motor Vehicle Company, Chicago—Capital $20,000. To manufacture automobiles, motors and vehicles. Incorporators: Isaac L. Marks, David J. Marks, Isaac B. Lipson.

Allen Taxicab Company, New York—Capital $1,000,000. To operate automobiles, taxicabs and other vehicles. Incorporators: Harry N. Allen, William Halpin, Arthur W. Osborn.

Motor Service Company, Jersey City, N. J.—H. L. Lechner, Doering Bellinger and W. G. Jones, incorporated with a capital of $100,000 to manufacture vehicles of all kinds.

Badger Auto Company, Oshkosh, Wis.—Capital $50,000. To manufacture automobiles. Incorporators: M. L. Cottrill, L. J. Monahan, J. D. Termaat, E. H. Fahrney.

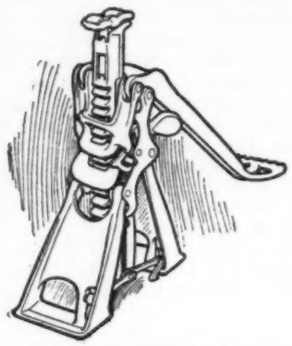
Information for Auto Users

S. & W. Auto Crank—This is a device intended to avoid the necessity of leaving the seat in order to crank the motor. It has no resemblance to the ordinary starting device, as it merely replaces the crank in front of the machine. It consists of a countershaft running along the motor, connected at the front end to the crankshaft by means of a sprocket, chain and ratchet device, and at the rear end to a crank suitably mounted on the dash. The ratchet on the crankshaft disconnects the countershaft and gearing as soon as the motor starts, so that there is no extra machinery in motion when the car is running. The device is claimed to be much simpler than any of the compressed air or coil spring starters, and

OPERATION OF S. & W. CRANK

has the additional merit of being absolutely positive; it will start the motor any time that the ordinary crank will start it. As there is a considerable gear reduction in the sprockets, the dash crank is very easy to turn. There is also no possibility of a back kick. The makers are Stryker & Woessner, Huron, Ohio.

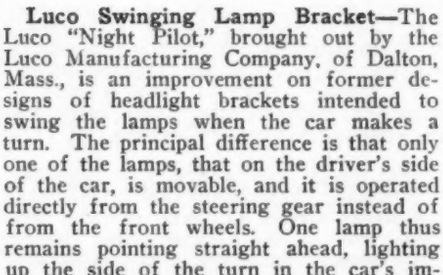
Spitzli Ratchet Auto Jack—No one has yet invented a way of dispensing with jacks, or of avoiding the occasions which necessitate their use; meanwhile, the best that can be done is to make the jack as compact and easily operated as possible. This has been the aim of the Spitzli Manufacturing Company, of Utica, N. Y., in designing its ratchet jack. It is compact in form and light in weight, and at the same time capable of handling heavy loads. The principle on which it is built enables the user to get a tremendous leverage. The jack works with either the hand or foot, and is instantly adjustable to the height of the axle. With every downward stroke of the handle the load is lifted half an inch, the special toggles then catch hold in such a way that it is impossible for the load to slip back. The action is easily reversible, so that the same downward stroke will lower the vehicle. The jack has a folding base, which expands to an unusual width, making it very steady in action. The jack fits under and out of the way of brace rods and trusses, and is especially desirable for use with overhanging tonneau or taxicab bodies. As an instance of its compactness and light weight, the



SPITZLI JACK IS VERY COMPACT

maker of the jack states that the No. 12 size, which is tested to lift automobiles up to 4000 pounds in weight, and is guaranteed against breakage or failure in operation, weighs only about 5½ pounds, and when folded occupies a space in the toolbox approximately 10½ by 3 by 3 inches.

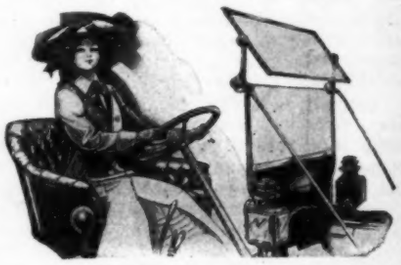
Luco Swinging Lamp Bracket—The Luco "Night Pilot," brought out by the Luco Manufacturing Company, of Dalton, Mass., is an improvement on former designs of headlight brackets intended to swing the lamps when the car makes a turn. The principal difference is that only one of the lamps, that on the driver's side of the car, is movable, and it is operated directly from the steering gear instead of from the front wheels. One lamp thus remains pointing straight ahead, lighting up the side of the turn in the car's immediate vicinity, while the other points down the road which the car is about to take. When not in use the bracket is



NIGHT PILOT LAMP BRACKET IN USE

firmly locked. It is supported on ball bearings, and the few working parts are so constructed that they cannot rattle, whether in operation or not. The device operates very easily, and the additional effort necessary to move it, in addition to the steering, is not noticeable. It can be attached in 20 minutes, without drilling or otherwise weakening the construction, and is unobtrusive in appearance. The moveable fork of the "Night Pilot" simply replaces the fixed one with a few simple connections; the same headlights are, of course, used, so that the total expense is but the cost of the device itself and a few minutes' labor.

Troy Automatic Windshield — The Sextette, as it is called by the maker, the Troy Carriage Sunshade Company, of Troy, Ohio, is capable of assuming six different positions, each of which will be found advantageous under certain combinations of circumstances. The first position, of course, is with both halves in line and vertical, as in the original form of windshield. The next is with the upper half folded down flat against the lower. Then come the special positions which lend the "Troy" its particular value. The upper glass is carried on hinged supports on either side at about the middle of its height. It can be tilted back on these supports to an angle of about 30 degrees from the vertical, so as to deflect the air currents upward, while at the same time the lower edge swings forward, leaving an open slit through which the driver can clearly see the road, no matter how wet the glass itself becomes. In warm weather, or when the bottom of the car heats up, this position can be reversed, the upper edge swinging forward and the lower edge back, so that the air is deflected into the car, striking about the knees of the front seat passengers. For drivers who believe that it distorts the vision to look through a slanting glass, the same effect can be secured with the upper glass vertical, parallel to the lower, but six inches to the rear of it. Or, finally, the upper glass can be tilted back



SEXTETTE WIND SHIELD PARTLY DOWN

with its lower edge still touching the other glass. In this position the upper glass is in line with the slanting stay-rods, giving it a very neat appearance. All positions are acquired automatically without set screws; the upper glass locks positively in position, and all parts are held together by a stiff spring so that they cannot rattle.

Osgood Automatic Lubricator—It is no longer necessary to argue for or against the use of a force-feed lubricator; their use is taken for granted. Among the newcomers in this line is the J. L. Osgood Lubricator Company, Buffalo, N. Y., with an oiler which has a number of new features. Some of these are the entire elimination of the usual bleeder test, absence of needle or throttle valves, the use of very simple pumps and the attachment of the same to the cover, so that the removal of the cover screws and the drive shaft allows of removing the whole lubricator bodily. Another worthy feature is the use of white celluloid discs for the regulating knobs.